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## POSSIBLE EFFECTS OF THE IMAGINAL TYPE OF THE SUBJECT ON APHASIC DISTURBANCES

By Samuel W. Fernberger, Clark University

It is obviously of both great theoretical and practical importance that a scheme of exact localization of lesions which show symptoms in disturbances in speech be formulated. Probably one of the most complete of such localization schemas is that of Wernicke and Lichtheim.[1] We have not mentioned this particular schema because we hold to it but merely by way of illustration.

All of the views of strict localization have come lately under rather severe criticism. Let us briefly consider some of the criticisms that have been offered. Adolf Meyer,[2] who does not consider aphasia as a separate disease but merely as one of the intellectual disorders which happens to involve language, is only one of many to point out the fact that apparently similar lesions in the cerebral cortex show intensely different symptom complexes.

Wundt and Pierre Marie [3] both show that with the presence of aphasic disturbances there is also a lowering of the general

[1] C. Wernicke, *Der aphasische Symptomencomplex*. Breslau, 1874. L. Lichtheim, Aphasia, *Brain*, VII, 1885, p. 437-ff.

[2] A. Meyer, The Present Status of Aphasia and Apraxia. *The Harvey Lectures*, 1909-1910, Philadelphia, 1910.

[3] W. Wundt, *Grundzüge der Physiologischen Psychologie*. 5th Ed., Vol. I, 1902, p. 307ff. W. Wundt, *Völkerpsychologie*. Vol. I, 1900. P. Marie, Revision de la question de l'aphasie. *La. Sem. Med.*, 1906, pp. 241, 493, 565.



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intelligence. Similarly the variation in function from day to day, as has been recently shown by Franz,[4] cannot be readily explained on the basis of the localization theories in the form in which they now exist.

Perhaps one of the most telling criticisms is that of Wundt in which he emphasizes the qualitative aspect of the loss of speech in progressive cases and in old age. The words for concrete objects,—such as proper names,—are the first to go. Somewhat more durable are the concrete verbs and most durable are the abstract ideas,—both nominal and verbal,—such as virtue, love, hate, have, become. And the absolutely last to be lost are the abstract particles and conjunctions. Wundt makes his criticisms largely on the basis of the findings of Kussmaul.[5]

Also Wundt criticises the Wernicke-Lichtheim, and with it all strict localization theories, in that they do not explain the facts of recovery of the speech function, either total or partial,—and the vicarious functioning of other centers which this recovery would involve. And finally many authors point to a number of apparently anomalous cases in the literature which are not explained adequately by any theory of strict localization.

It is certainly true that the theories of the strict localization of the language function,—we have merely taken the Wernicke-Lichtheim schema as an example,—do not adequately meet any or all of these criticisms in the form in which these theories now stand in the literature. One type of attempted explanation is on the basis of Charcot's[6] insistence on individual differences. Charcot differentiated three types of individual,—the visual, auditory, and motor types.

We believe that Charcot was on the right track and that an extension of this concept will, when added to the theories of strict localization, adequately answer all of the criticisms enumerated above. During the last twenty years advances have been made in experimental psychology on the basis of which we have radically changed our concepts of both imaginal types and of the importance of language for thought.

For Charcot the three types were more or less hard and fast. An individual either employed, exclusively or almost exclu-

[4] S. I. Franz, On Certain Fluctuations in Cerebral Function in Aphasics. *Jour. of Exper. Psychol.*, I, 1916, p. 355ff.

[5] A. Kussmaul, Entgegung die Aphasie betreffend. *Fort. d. Med.*, 1883.

[6] J. M. Charcot. Des varieties de l'aphasie. *Progress Méd.*, 1883.

sively, visual images, or auditory images, or motor images in his thinking. The modern view, probably best expressed by Meumann,[7] indicates that the individual may use a considerable number of modalities of imagery in his thinking and recalling, but that he habitually employs one or two with much greater frequency than the others. Probably the most frequent types are the mixed types in which more than one form or modality of imagery is habitually employed. Probably the type most frequently met with recalls concrete experiences in concrete visual terms in combination with recalling abstract experiences in motor verbal terms. From which it will be seen that we must make a distinction, not only in the modality which an individual habitually employs but also the distinction between the modality for recall of concrete and verbal materials.

Another fact that has been brought out by the experimental work in psychology is that there is a great difference between the sorts of imagery which we are capable of calling up voluntarily and the modalities of imagery which we actually employ in our ordinary everyday thinking and remembering. Hence the filling out of a questionnaire such as that employed by Galton,[8] while it gives a picture of what the actual imaginal endowment may be, does not give an adequate and, indeed, gives an erroneous picture of the kinds of all these possible images that are actually employed in meeting and solving the problems of daily life.

Galton, himself, was impressed by still another fact, the frequent use of verbal imagery and the inability to employ concrete (especially visual concrete) imagery among a selected group of intellectual men whom he studied by means of this questionnaire. Such a result is one, however, which we believe Galton might well have anticipated. With education we have a shift from dealing almost solely with concrete things to dealing with more and more abstract materials. It is possible to have an imaginal representation of an abstract concept in the form of a concrete image,—we know of just one such case,—but the usual form of such an abstract representation is in some verbal form. Hence in abstract thinking we have a greater and more frequent use of the verbal forms of imagery. Mere casual introspection will verify this fact which is also

[7] E. Meumann. *The Psychology of Learning.* (Trans. by J. W. Baird.) New York, 1913, p. 179ff.

[8] F. Galton. *Inquiries into Human Faculty and its Development* New York, 1883, p. 86ff.

clearly brought out by numerous careful experimental introspective studies.[9]

Let us now see how these concepts may be applied to an explanation of the various criticisms that have been brought forward against the localization theories of aphasia. In the first place, the fact that apparently similar lesions will show widely different symptom complexes is readily explained largely on a mere extension of the explanation advanced by Charcot himself. As an example, let us take definite cases whose imaginal type has been carefully and systematically studied. A former student of this laboratory, Dr. R. H. Wheeler, now Assistant Professor of Psychology, University of Oregon, is very strongly of the visual type. Visual images, both concrete and verbal, are largely employed in his thinking and in his recalling of past experiences. It is he, indeed, who frequently has a concrete visual imaginal representation of an abstract concept. Verbal motor and auditory (both concrete and verbal) images are also employed by him but not nearly to the same extent as the visual modality. If he wishes to recall a forgotten word it will almost always occur first as a visual verbal image, either of the printed word or of the word written in his own handwriting.

My own case is the other extreme. I do not remember ever having had a clear and durable visual image. Fleeting, nonfocal and unclear visual images sometimes come into consciousness, but their occurrence is exceedingly infrequent and, when they occur, such images are always accompanied by a complex of other images so that I believe that their presence in consciousness is entirely non-essential. I do not remember ever having had a visual verbal image of any sort. My thinking is carried on almost entirely in terms of verbal motor images and motor and auditory concrete images,—all of which are very clear, durable, and of frequent occurrence.

We have chosen two cases of extreme variation but both subjects have been carefully studied and a description of their conscious contents appears elsewhere in the literature.[10] Con-

[9] E. O. Finkenbinder. The Remembrance of Problems and of their Solutions. *Amer. Jour. of Psychol.*, XXV, 1914, 32-81. E. L. Woods. An Experimental Analysis of the Process of Recognizing. *Amer. Jour. of Psychol.*, XXVI, 1915, 313-387. S. C. Fisher. The Process of Generalizing Abstraction; and Its Product, the General Concept. *Psychol. Mono.*, No. 90, 1916, v. 213. S. C. Fisher. An Analysis of a Phase of the Process of Classifying. *Amer. Jour. of Psychol.*, XXVIII, 1917, 57-116.

[10] See the articles enumerated in footnote 9.

sider, then, the tremendous differences that would result in the symptom complexes in these two cases from a similar localized cortical lesion. If this lesion involved the visual verbal center, the loss in the case of Professor Wheeler would be exceedingly profound; while, in my own case, I am convinced that there would be little perceptible loss in my ability to handle the language functions. If the localized lesion were in the motor verbal center, both of us would sustain a loss in our ability to handle the language functions, but the loss would be very much more profound in my own case than in that of Professor Wheeler. I am convinced that a lesion in the verbal motor center would practically deprive me of the use of language in any form. This is true for both speaking and the understanding of spoken and written language as I find an almost universal use of accompanying verbal motor images in my reading and listening to difficult spoken language. There is also, in my own case, almost invariably concomitant verbal motor imagery when I write. We therefore believe that differences in the imaginal type of individuals before the onset of the aphasic disturbance would account for any differences in symptom complexes which have been brought out in the literature as resulting from approximately similar cortical lesions.

The discussion of my own case, given above, brings us to a consideration of the second criticism of the localization theories,—the lowering of the general intelligence accompanying aphasic disturbances. We have pointed out above that the experimental testimony all emphasizes the importance and frequent occurrence of verbal processes in our thinking and in the rest of our so-called higher intellectual processes. Indeed, for most of us, the representation of abstract ideas, with which our higher thinking is so largely concerned, cannot or at least is not present to consciousness in concrete form. This representation of abstract ideas seems to be entirely carried on in terms of verbal images of one modality or other. Hence any impairment of the ability to handle verbal images will *ipso facto* be accompanied by an impairment of the ability to handle the abstract concepts which are so essential to thinking. And, furthermore, we may expect wide individual differences in the extent to which the general intelligence will be impaired, depending on both the imaginal type of the individual before the onset of the disease and on the nature of the lesion. Let us again consider the cases of Professor Wheeler and of myself. It may be believed that a lesion in the visual verbal cen-

ter would result in a considerable lowering of Professor Wheeler's general intelligence; while such a lesion would have but little effect in my own case. On the other hand, a lesion in the motor verbal center would have the effect of lowering Professor Wheeler's general intelligence to a much less extent than one in the visual verbal center. But a lesion in the verbal motor center in my own case would have a most profound effect in lowering my general intelligence.

Let us next consider the question of recovery. We find individuals who are at one time profoundly affected but who later either partially or wholly regain the power of understanding or using language. Such a recovery may, of course, be explained in some cases in terms of the resumption of function of some cerebral area which has not been actually destroyed, by the removal of pressure or the absorption of a blood clot, or what not. But such an explanation will not include all cases, and we find partial recovery in cases where post-mortem examination shows an actual destruction of tissue. Such a recovery,—and the cases in the literature do not show that these recoveries are ever complete,—must be explained on the basis of the vicarious functioning of some other area of the cortex. We will attempt to explain such vicarious functioning in psychological rather than in anatomical or neurological terms. The cases of Professor Wheeler and myself, where one single modality of imagery is so strongly emphasized, must be considered as extreme and very unusual cases. Most individuals are of decidedly mixed types and employ two or even three modalities of imagery to approximately the same extent. Now if one of these several usable modalities be eliminated, there will at first be a lowering of the ability to employ the language functions. But in time the individual will be able, through practice, to employ one of the other usable modalities of imagery, and, hence, the ability to handle language will be at least partially restored. The experimental evidence makes it appear very doubtful if we are ever able to train, to any great extent, any modality of imagery which was not readily usable before the disturbance.[11] Vicarious functioning in the sense of the taking over of the functioning of one modality by another which has not been employed to any

[11] Cf. E. B. Talbot. An Attempt to Train the Visual Memory. *Amer. Jour. of Psychol.*, VIII, 1897, 414-417. L. Witmer. A Case of Chronic Bad Spelling. *Psychol. Clinic*, I, 1907, 53-64. M. Fernald. The Diagnosis of Mental Imagery. *Psychol. Mono.*, No. 58, 1912, p. 82ff.

extent before the disturbance does not seem to be what happens. What we do have seems to be rather a shift of emphasis from the modality which has been lost to some other modality which itself was highly usable before the attack and which, now that it exists in practical isolation, takes on the function of the entire expression and understanding of language. Again on the basis of this concept, we might expect great individual differences in the extent of the recovery dependent upon the complexity of the imaginal types of the patients before the onset of the disease, with regard to both the number of usable modalities of verbal imagery and also to the intimacy of the relations between these modalities.

The qualitative aspect of the way that the various parts of speech are lost in cases of progressive aphasia and in old age is a fact which again we believe might have been anticipated. The clear distinction has been made between verbal and concrete imagery,—both of which forms may be of several modalities. We believe that with progressive total aphasia *all* language becomes increasingly difficult. Thus the use of all forms of verbal imagery becomes difficult, but we have no reason to believe that the use of concrete images has been impaired. However, in the earlier stages, it is still possible to recall and use the verbal images but these come to consciousness more slowly than heretofore, come with less spontaneity and, from the qualitative side, are less clear and focal, less intensive, and less durative. Imagine an individual in such a condition. If he wishes to recall a friend, or a clock or some other concrete object it is possible to get a perfectly satisfactory imaginal representation of that concrete object in concrete terms. It is not necessary to recall any verbal representation at all and, as such a verbal representation comes with great difficulty, the subject does not force himself to make such a recall as he already has a satisfactory representation of the object. But in the case of the abstract concept no concrete representation is possible except in rare cases, and so the subject has to force himself to recall the verbal representation. And the most abstract of all ideas are the interjections and conjunctions, ideas for which a concrete imaginal representation does not seem possible to us, and it is these parts of speech which are lost only finally and eventually when the language function itself is entirely lost.

Experimental work has shown that there are decided daily variations in a normal individual with regard to the spontaneity and clearness with which images occur in conscious-

ness. Some of the causes for such attributive changes in the normal subject are to be sought for in the influence of the weather, temperature, state of fatigue, and the general physiological condition. We believe that similar changes in the spontaneity, clearness, and intensity with which verbal images occur in consciousness may be expected in partial aphasics, in whom ability to use these images is not lost but only impaired. Indeed we would expect that the changes would be relatively more profound in the individual who has partially lost his ability to handle a certain type of imagery than it would be in the normal individual. And we believe that such variations in the occurrence of the attributive aspects of the image would account for the fluctuations of function reported by Franz.

Let us finally consider how this concept may explain certain apparently anomalous cases that have appeared in the literature. Let us consider only one case, that of the Russian General reported by Charcot. Before the attack this patient was able to speak Russian, French and German. After the attack he was unable to speak French and German while his ability to speak Russian was relatively unimpaired. Later this individual reacquired his ability to speak French but he never improved in German. Let us now consider a possible reconstruction of this case. In the first place we will assume that this individual was of a mixed visual and motor verbal type,—that he was able to use and did habitually use verbal images of both modalities. Let us now try and reconstruct the psychological basis for his acquisition of these three languages. Russian was learned in childhood and was undoubtedly learned in verbal motor fashion. French was the Russian Court language of the time and was taught in early childhood in both verbal motor and verbal visual fashion. Indeed when we consider the court conditions in Russia at the time, we may believe that probably a great deal of emphasis was laid on the writing of French as the court people of the time seldom wrote Russian at all. German was usually acquired much later than the French and with a strong emphasis on reading and very little on speaking the language. If the reader will grant the assumption that this individual was of the strongly mixed verbal visual and motor type, we may believe that the imaginal representations of these languages was about as follows:—Russian, almost wholly verbal motor; German, almost wholly verbal visual; and French, strongly mixed verbal visual and motor. Now if the destruction had been of the verbal visual center with its stock of images, we should expect

little impairment of the ability to handle Russian but total impairment of the German and great impairment of the French. But inasmuch as the French was already partially retained in the form of usable verbal motor images, one would expect a recovery of the use of that language,—due to the vicarious functioning of this other modality. This vicarious functioning, however, which must be considered rather as a change of emphasis from one already usable modality to another, rather than the assumption of a function of a modality which has been lost by some other modality which was not before usable.

All this, of course, is obviously the most extravagant sort of theorizing. We are not attempting to hold a brief for any particular theory of strict localization of the language functions. That schema must be supplied by the neurologists. We hope to have shown, however, that there are no valid theoretical reasons why such an envisagement of the problem is not proper and possible.

In order to answer the criticisms that have been offered, we have advanced the more modern concept of imaginal types and other experimental evidence of a psychological nature. This concept of imaginal types has made radical advances and sustained profound changes since its introduction by Charcot and by his pupil Ballet. But we believe that they were on the right track when they introduced this concept to explain the invalidity of the criticisms against a strict localization view of aphasia.

This matter of the possible effect of imaginal type of the individual upon the aspects of aphasic disturbance cannot be decided until we have clinical observations upon some individuals whose imaginal types have been well known and completely studied before the onset of the disease. A half dozen such cases would clear up the matter to a great extent and would go a long way toward either proving or invalidating our present contentions. Unfortunately it is usually not possible to obtain much information about the normal imaginal type of an individual by the time that he gets into the hands of the clinician. There are several reasons for this. The average man of the world usually does not know anything about his imaginal type, and so questioning in the hands of the clinician brings out merely the modalities which the subject could use voluntarily and not those which he habitually employed in his thinking. Secondly, the clinician cannot make tests of imaginal type after the subject gets into his hands because the

onset of the disease is either sudden or, if gradual, has progressed rather profoundly before he comes for examination. Hence this question may have to wait for solution until some introspective psychologists, whose types have been carefully studied and the results of such studies have appeared in the literature, have some aphasic disturbance so that we may study their symptom complexes and their prognosis and the history of the course of the disease in the light of their known imaginal types.

# PSYCHOLOGY AND HISTORY:[1] SOME REASONS FOR PREDICTING THEIR MORE ACTIVE CO-ÖPERATION IN THE FUTURE

By Harry Elmer Barnes,
Department of History and International Relations, Clark University

## I. The Chief Phases of the Development of Historiography[2]

### 1. *The Growth of Scientific Method in Gathering the Data of History*

Though history, as a record of human achievement in the widest sense of that term, goes back to the earliest archeological evidences of man's handiwork which have persisted since the first stone ages, it is only within the last century that written history has been either relatively complete in its scope or decently accurate in its content. Its progress has been the result of the successive contributions of every age from the days when the first savage began to scrawl picture-writing on stones or trees to the appearance of Giry's treatise on *Diplomatic* or the publication of Merz's "History of European Thought in the Nineteenth Century." The honor of having originated the first real historical narrative belongs to the Hebrew author of the Jahvist sources of the Old Testament at the close of the 10th century B. C. Most significant improvements were made by the Greek and Roman writers of classical antiquity. Herodotus first conceived the notion of a history of civilization; Thucydides introduced the principles of accuracy and

[1] The following survey of some of the chief relations between history and psychology can in no way be regarded as the view of the majority of present day historians. Even the general attitude towards the subject taken in this article constitutes the point of view of only a small group of the more advanced historical students, while for this particular exposition of their doctrines the author must be held personally responsible. Others in sympathy with this same point of departure might present the subject in a radically different and more effective manner.

[2] For a fuller sketch of the main stages in the growth of historical science the reader is referred to the writer's article on "History: Its Rise and Development," in the forthcoming edition of the *Encyclopedia Americana*.

relevance into the handling of historical material; Caesar revealed himself to be a keen observer of contemporary history and an unequalled writer of apologetic historical memoirs; Livy's patriotic rhetoric has never been surpassed, while Tacitus stands out as the greatest portrait painter and moralist among the historians of antiquity. With the coming of the so-called "Middle Ages," history writing, along with other branches of culture, suffered a marked decline and retrogression, due to the paralyzing Christian eschatology and the primitive cultural level of the northern barbarians who overthrew the declining Roman civilization in the period following the 4th century. Even the greatest historians of this age—Bede, Paul the Deacon, Otto of Freising, Matthew of Paris and Commines, failed to reach the level of Thucydides and Tacitus. The literary revival following the 13th century known as Humanism, secularized the historian's viewpoint, led to the recovery and editing of lost classical texts, created some embryonic canons of historical criticism, and produced in the works of Machiavelli and Guicciardini systematic histories worthy to rank with those of the best classical writers. This secularizing and critical movement was set back by the great religious reaction in the Protestant revolt and the Catholic Counter-Reformation, but some progress was made even here through the feverish attempt to recover the sources of ecclesiastic history. With the dawn of the modern order following the Commercial Revolution of the 16th century many most significant innovations were brought into the field of historical science. The discovery of new lands, peoples, customs, and institutions widened the outlook of the historian. The new scientific philosophy shattered the "Christian Epic" and produced a healthy interest in mankind and its development. The subsequent development of Romanticism produced an intellectual reaction, but this was to some degree off-set by the great emotional interest which it aroused in history and by the extension of the interest of the historian to many new fields, such as philology, mythology, anthropology and comparative religion. The growth of nationalism following the French Revolution stimulated the production of the great collections of the sources of national history like the German *Monumenta*, the *Documents Inédits* and the *Rolls Series*, and the patriotic national histories associated with the works of Droysen, Treitschke and Sybel; Froude, Macaulay and Green; Michelet and Martin; and Bancroft and Fiske. The critical sifting of historical evidence, which had begun in the days of Humanism in

the work of Blondus, Beatus Rhenanus, Vadianus, Zurita, Camden and De Thou, was revived and carried on by Mabillion and the Benedictines of St. Maur, and by Tillemont, Leibnitz, Mauratori, Thoyras, Bayle, Dubos and Beaufort. Most of the previous lines of development converged in the work of Barthold Niebuhr, who is conventionally regarded as the founder of modern scientific historiography. Since his day the critical methodology has been further refined and the events of the past scientifically determined and catalogued in the works of the students of oriental and classical history, the ultra-scholarly medievalists and the more objective national historians, such as Ranke, Aulard, Gardiner, Osgood and Channing.

In this way vast collections of well ascertained facts were brought together and the mechanism of the historical scholar perfected in so far as it related to the externals of historical information. But in almost all cases the labors of these historians had resulted only in the collection of the *data* of history. History was in a condition not unlike that in which the physicist, chemist, or biologist would find himself if supplied with a vast body of notebooks containing the carefully set down records of countless experiments, but without any real attempt to interpret the significance of this mass of material or to derive from it great scientific laws of general applicability. This inclination of the majority of historians to resist being seduced from the determination of facts and the narration of successive events was not without some basis at the time. The memory of grotesque attempts like that of Hegel, to adapt the facts of history to substantiate a fantastic view of historical development was fresh in their mind and, moreover, the facts upon which any sound interpretation could be based had not yet been fully gathered. It would, however, betray clouded thinking to hold that this gathering of facts marked the final completion of the task of the historian no less than it would for the scientist to contend that his work was at an end when he had tabulated his observations. The careful and painstaking interpretation of historical material, far from being unscientific and wholly aside from the task of the historian, in reality constitutes the final rounding out to completion of the scientific method in history and gives some meaning and significance to the vast array of facts which have been brought together by previous historians. This matter has been effectively stated by Professor James Harvey Robinson in the following citation:—

"History, in order to become scientific, had first to become historical. Singularly enough, what we now regard as the strictly historical interest was almost missed by historians before the nineteenth century. They narrated such past events as they believed would interest the reader; they commented on these with a view of instructing him. They took some pains to find out how things really were—*wie es eigentlich gewesen*. To this extent they were scientific, although their motives were mainly literary, moral, or religious. They did not, however, in general try to determine how things had come about—*wie es eigentlich geworden*. History has remained for two or three thousand years mainly a record of past events, and this definition satisfies the thoughtless still. But it is one thing to describe what once was; it is still another to attempt to determine how it came about."[3]

## 2. *The Development of Attempts to Interpret the Data of History*

As Professor Shotwell has made clear,[4] the prevailing types of historical interpretation through the ages faithfully reflect the dominating intellectual interest of the successive eras. The Divine epics of the ancient Orient were superseded by the mythological and the philosophical interpretations of the thinkers of classical antiquity. With the general acceptance of Christianity, the classical mythology was replaced by that eschatological conception which dominated historical interpretation from Augustine to Bossuet. With the coming of the Commercial Revolution and its violent shock to the old intellectual order, there arose the critical and rationalistic school of Bacon, Descartes, Voltaire and Hume, which on account of its being too far in advance of the intellectual orientation of the masses, tended to lapse into the idealism of Kant and Fichte and the romanticism of Burke, Bonald, DeMaistre, and Hegel. The growth of nationalism following the French Revolution tended to give temporary precedence to the political mode of interpretation, but the great transformations which constituted the Industrial Revolution of necessity doomed so superficial a view to an ephemeral existence. The unprecedented breadth and depth of modern knowledge and intellectual interests have produced a number of interpretations of historical development, most of which represent the outgrowth of some one or another of the outstanding intellectual and social transformations of the last century.

With the growth of modern natural science and the critical

[3] J. H. Robinson, *The New History*, p. 62. Cf. also J. T. Shotwell, "The Interpretation of History," in *The American Historical Review*, July, 1913, pp. 692ff.

[4] Shotwell, loc. cit.

attitude in the appropriation and assimilation of knowledge, the effort to form some magnificent and systematic philosophical scheme for the organization and presentation of historical development, such as was devised by writers from Augustine to Hegel, has greatly declined. Scepticism of any formal philosophy of history seems to be but a necessary accompaniment of our increasing knowledge of the infinite complexity of social and historical phenomena, as these attempts to reduce history to such simplicity savor too much of the *à priori* method, now so thoroughly discredited. To take the place of the older dogmatic philosophy of history there have developed what may be called "interpretations" of historical data. These at present differ from the older philosophy of history in the absence of any teleological element and in the rejection of the deductive method.[5] They aim solely to emphasize and bring into high relief those factors, which, according to the various schools of interpretation, seem to have been most influential in producing the civilization of to-day. The interpretation of history is, in short, the attempt to supplement Ranke's aimless search for what occurred in the past by at least a feeble and humble effort to explain how the present order came about. Far from being less scientific than the older program of Ranke, it really constitutes the perfect completion of scientific method in historiography, in the same way that the formulation of the great laws of natural science constitute the logical consummation of the task of gathering data by observation and experimentation in the laboratory.

There are at present some eight definite schools of historical interpretation among the representatives of the modernized students of historical phenomena, each of which has made an important contribution to our knowledge of historical development. They are in no sense mutually exclusive but are rather, to a large degree, supplementary. They may be designated as the personal or "great man" theory; the economic or materialistic; the allied geographical or environmental; the spiritual or idealistic; the scientific; the anthropological; the sociological; and the synthetic or "collective psychological." It may be pointed out in passing that, in the main, the older type of historian either clings to the outworn theory of political causation or holds that historical development is entirely arbitrary and obeys no ascertainable laws. The best known of these schools of historical interpretation, and the only one

[5] Shotwell, loc. cit., p. 693.

that the current political historians accord any consideration, is that which found its most noted representatives in Carlyle and Froude, who claimed that the great personalities of history were the main causative factors in historical development. This view is, of course, closely allied to the catastrophic interpretation of the 18th century nationalists. Perhaps the most distinguished adherents today are Prof. Émile Faguet of Paris, Mr. W. H. Mallock of England, and Prof. William A. Dunning of Columbia University. The contributions of the economic school of historical interpretation, which was founded by Feuerbach and Marx and has been carried on by a host of later and less dogmatic writers, such as Rogers, Ashley, Schmoller, Loria, Veblen, Simons, Beard, Bogart, and Simkhovitch, are too familiar to call for any additional elaboration. In its best and most generally accepted form, it contends that the prevailing mode and status of the economic processes in society will to a very large degree decide the nature of existing social and political institutions. In spite of slight exaggerations, no phase of historical interpretation has been more fruitful or epoch-making. Immediately related is the geographical interpretation of history, which began with Hippocrates and continued through the writings of Strabo, Vitruvius, Bodin, Montesquieu, and Buckle and has been revived and given a more scientific interpretation in the hands of such writers as Karl Ritter, Ratzel, Reclus, Semple, Metchnikoff, Demolins, and Huntington. Since the days of Ritter no respectable historian has dared to chronicle the history of a nation without first having acquired a knowledge of its geography. Widely at variance with the economic and geographical interpretation is the somewhat belated offshoot of the idealism of Fichte and Hegel, to be found in the so-called spiritual interpretation of history, which finds its most ardent advocates in Prof. Rudolph Eucken of Germany and Prof. Shailer Matthews of Chicago. Professor Matthews thus defines this view of history: "The spiritual interpretation of history must be found in the discovery of spiritual forces coöperating with geographic and economic to produce a general tendency toward conditions which are truly personal. And these conditions will not be found in generalizations concerning metaphysical entities, but in activities of worthful men finding self-expression in social relations for the ever more complete subjection of physical nature to human welfare." Viewed in this sense, this type of interpretation can be said to have a considerable affinity with the "great man" theory and

apparently aims to reconcile this doctrine with the critical and synthetic interpretation, under cover of a common theological orientation. Closely conformable to this mode of interpretation is Prof. E. D. Adams' effort to connect the historical development of the United States with a succession of great national ideals, the origins of which are not explained. The attempt to view human progress as directly correlated with the advances in natural science received its first great exposition in the writings of Condorcet, was revived by Comte and Buckle and greatly attracted Henry Adams. Aside from the attention given to it by students of the history of science, such as Dannemann, Sarton, Duhem, Tannery, Pearson, Shipley, Whetham, Libby, and Sedgwick, this phase of historical interpretation has been sadly neglected by recent historians, though Prof. F. S. Marvin and Prof. Lynn Thorndike have recently shown its promising potentialities. It has been emphasized incidentally by Professors Lamprecht, Seignobos, Shotwell, and Robinson in their synthetic interpretation of history, but it remains the least exploited and yet, perhaps, the most promising of all the special phases of historical interpreration. Its adherents claim a more fundamental causal importance than can be assigned to the economic interpretation in that they contend that the prevailing state of scientific knowledge and application will determine the existing modes of economic life and activities. Especially fruitful has been the anthropological interpretation of history. While not ignoring the contributions of earlier students, modern anthropology owed its origin primarily to the researches and writings of Tylor in England, Bastian in Germany, and Boas in America.[6] Its purpose is, according to Professor Boas, "to reconstruct the early history of mankind, and, wherever possible, to express in the form of laws ever-recurring modes of historical happenings." The chief point of contact between anthropology and history is found in the attempt of the former to discover and formulate the laws of cultural evolution. With the controversies between the older school of unilateral evolutionists, represented by Spencer, Avebury, Morgan, and Frazer, the more recent advocates of the doctrine of "diffusion," such as F. Graebner, W. H. R. Rivers, and Elliott Smith, and the exponents of the so-called theory of the "convergent development" of cultural similarities and repetitions, among the most important of whom are Ehrenreich, Boas, Lowie, and Goldenweiser, it will be impossible to

[6] Cf. A. C. Haddon, *History of Anthropology.*

deal in this place.[7] It will be sufficient to insist upon the fact that no historian can regard himself as competent to attempt any large synthesis of historical material without having thoroughly acquainted himself with these fundamental attempts to bring definite laws of development out of the chaos of historical facts. An attempt to link up cultural anthropology with a dynamic history has recently been made in two thoughtful books by Professor Teggart of the University of California.[8] Dr. Goldenweiser in a recent profound article has endeavored to provide a set of categories and a systematic methodological point of departure for scientific history and critical anthropology.[9] The closely related sociological interpretation of history goes as far back as the Arab, Ibn Khaldun; was developed by Vico, Turgot, Ferguson, Condorcet, Comte, and Spencer; and has its ablest modern representatives in Professor Giddings of Columbia, Professor Thomas of Chicago, and Professor Hobhouse of London.[10] Professor Giddings admirably describes this theory as "an attempt to account for the origin, structure and activities of society by the operation of physical, vital and psychical causes, working together in a process of evolution."[11] As a genetic social science, it works hand in hand with cultural anthropolgy in the effort to explain the repetitions and uniformities in historical development and to formulate the laws of historical causation. But the latest, most inclusive, and most important of all types of historical interpretation, and the one which, perhaps, most perfectly represents the newer history, is the synthetic or "collective psychological." According to this type of historical interpretation no single category of "causes" is sufficient to explain all phases and periods of historical development.

[7] A good summary of the literature of these theoretical positions in modern anthropology is contained in A. A. Goldenweiser's "The Principle of Limited Possibilities in the Development of Culture," *Journal of American Folklore*, 1913, Vol. XXVI. See also R. H. Lowie's *Culture and Ethnology*, and F. Boas, *The Mind of Primitive Man*, Chapter VII.

[8] F. J. Teggart, *Prolegomena to History; The Process of History.*

[9] A. A. Goldenweiser, "History, Psychology and Culture: A Set of Categories for an Introduction to Social Science," in *The Journal of Philosophy, Psychology and Scientific Methods*, 1918.

[10] This statement is not to be taken as an indication of the position of these writers in the general sociological field, but refers merely to their preëminence in the field of historical sociology.

[11] F. H. Giddings, *The Principles of Sociology*, p. 8; but see particularly his "A Theory of Social Causation," *Publications of the American Economic Association*, 3rd series, Vol. V, No. 2.

Nothing less than the collective psychology of any period can be deemed adequate to determine the historical development of that age, and it is the task of the historian to discover, evaluate, and set forth the chief factors which create and shape the collective view of life and determine the nature of the group struggle for existence and improvement. The most eminent leaders of this school of historical interpretation, though with widely divergent antecedents and points of view, have been Professor Lamprecht of Leipzig; Professor Ferrero of Italy; Professors Tarde, Lévy-Bruhl, Fouillée, Seignobos, and Durkheim of Paris; Professors Marvin, Zimmern, and Barker of London; and Professors Robinson and Shotwell of Columbia University. Their general doctrine has gained particular acceptance in France, probably on account of the early and extensive development of social psychology in that country.

## II. The Psychological Interpretation of History.

### 1. *The Nature and Historical Background of the Psychological Interpretation of History.*

The essence of the psychological interpretation of history is the thesis that the determining factor in historical development is the collective psychology of an era and of a given cultural group. Its adherents rightfully claim that it is not only the most scientific but also the most all-inclusive of the various types of historical interpretation. It is the most scientific because it is now generally agreed that man functions as an active agent through his mental mechanism, and the most comprehensive because it takes into account every influence operating upon the group studied, which would in any way affect its psychic reactions. While broad in its scope, however, it is much more coherent and specific than a general history of events in that it has a definite orientation and organizing principle. While this interpretation is primarily socio-psychic, it gives due consideration to the part played by the dominating personalities in shaping the collective psychology and would even, in a complete form, attempt a psychological interpretation of these very personalities, in so far as such procedure is possible.

It is often held that the origin of the present day psychological interpretation of history is an offshoot or further development of the older subjective philosophies of history, which culminated in the grand, if fantastic, schemes like those of Hegel and the Romanticists, but it seems much more accurate

to regard it as a product of the growth of modern science and civilization. The Deists brought forth the notion, in fundamental opposition to the depressing theological views of Augustine and Calvin, that man is inherently decent and that his action is subject to natural laws, such as had been revealed by Newton and his fellow scientists. They held that man was both worth studying and possible to study. Another important prerequisite was the further development of experimental natural science, and particularly of psychology. Especially significant and stimulating was the new genetic psychology set forth by G. Stanley Hall and J. Mark Baldwin, which emphasized the illuminating and useful analogy between the mental development of the individual and the race.

But individual psychology, important as it is, could not supply all that was needed to furnish the mechanism for the psychological interpretation of the historical processes; it was necessary to have a social psychology built up on the laws of individual psychology and sociology. For this the growth of modern industrialism was the utmost significance. This brought with it the increase in the volume and rapidity of social and psychic contacts through the concentration of the population in the great industrial cities and through the development of the new means of communicating information. As a natural result of these antecedents there grew up in the latter half of the 19th century a science of collective or social psychology, which was foreshadowed by Lewes, Bagehot, Lazarus, and Steinhal, and was effectively cultivated by Wundt, Dilthey and Tönnies in Germany; by Fouillée, Guyau, Tarde, Durkheim, and Le Bon in France; by Sighele in Italy; by McDougall, Trotter, and Wallas in England; and by Giddings, Ross, Sumner, Cooley, Ellwood, Baldwin, Davis, and Bogardus in America.[12]

While this new social psychology was primarily devoted to a general analysis of contemporary conditions or to forming a theoretical basis for systematic sociology, even these writers made some very significant contributions to the psychological interpretation of history. Dilthey's analysis of the relation of history to the sciences of the mind; Tarde's notion of the importance of imitation in the continuity of history; Durkheim's views on the significance of the crowd-psychological state in cultural and social development; Trotter's elaboration of the significance of "herd-instinct;" Sumner's most suggestive analysis of the importance of the "folkways" and

[12] See M. M. Davis, *Psychological Interpretations of Society.*

"mores;" and Ross' study of the psychic basis of social control, are among the best known of these valuable suggestions handed over from this field to aid the progressive historian. At about the same time that social psychology was being elaborated there was gradually developing a genetic view of history — the idea of the continuity of history, which is based upon the knowledge that our present cultural complex is primarily the product of a long inheritance from past conditions and that the present can be understood only when viewed in the light of its historical antecedents.[13] When this attitude towards history was accepted by a few of the more progressive students it was easy for them to comprehend that social psychology had put at their disposal exactly the methodology and point of attack which was necessary to interpret the significance of history and show how the modern age had come about. It seemed clear that if the collective psychology was an all-important factor in modern life, it should have had a great, if not equal, significance in all ages. The systematic following up of this clue has constituted essentially the psychological interpretation of history in so far as it has yet been developed.

There were, to be sure, some much earlier anticipations of this point of view. Voltaire had explained cultural differences as being due to the variation between the distinct genius of one people and that of another, but his view that this "genius" was essentially immutable was non-historical. Turgot had set forth the notion of the continuity of history. The Romanticists, following Herder, had regarded civilization as the product of obscurely working creative psychic forces and had revelled in discussions of the *Weltgeist* and the *Zeitgeist*. Comte had set forth his very suggestive interpretation of the psychic evolution of mankind according to the three stages of intellectual development — the theological, the metaphysical and the positive or scientific. Burckhardt, Freytag, and Riehl in Germany, and Green in England emphasized the significance of the masses as opposed to the few conspicuous individuals. Taine had laid great stress upon the psychic milieu as a factor in cultural development, and Bagehot had presented his brilliant survey of political development from the custom-making age, through the period of the origin of states to the age of discussion. But none of these examples of a trend towards the psychological interpretation of history were based upon a

[13] This concept of the continuity of history was first systematically stated by Turgot in his Discourses at the Sorbonne in 1750. See Stephens, *Life and Writings of Turgot*, pp. 159ff.

sound comprehension of either scientific psychology or a genetic history. The first systematic attempt to correlate history and psychology was the work of the distinguished Leipzig historian, Karl Lamprecht, who based his doctrines on the psychological investigation of the famous Leipzig psychologist, Wilhelm Wundt.

## 2. *Karl Lamprecht's Socio-Psychological Interpretation of History*

Winning recognition as a historian by a voluminous monograph on the medieval economic history of the Rhine valley, Lamprecht began to publish his *Deutsche Geschichte* in 1891, in which he illustrated his views on historical interpretation. From that time until his recent death he accompanied his systematic historical work by an unending controversy with the exponents of the older historical notions. In this debate he upheld his thesis that "history is a socio-psychological science" concerned primarily with the "social-psychic," as contrasted with the "individual-psychic" factors which had been emphasized by the previous conventional narrative and biographical history. To him history was the collective psychology of the past rather than the collective biography, as had been the opinion of the typical historian who had generally followed Carlyle's views on historical causation, if, indeed, he believed in historical causation at all. Probably the best succinct statement of Lamprecht's principles is contained in the following summary by the eminent English historian John B. Bury:

> "Among the evolutional attempts to subsume the course of history under general syntheses, perhaps the most important is that of Lamprecht, whose 'Kulturhistorische' attempt to discover and assign the determining causes. German history exhibits the (indirect) influence of the Comtist school. It is based upon psychology, which, in his views, holds among the sciences of mind (*Geisteswissenschaften*) the same place (that of a *Grundwissenschaft*) which mechanics hold among the sciences of nature. History, by the same comparison, corresponds to biology, and, according to him, it can only become scientific if it is reduced to general concepts (*Begriffe*). Historical movements and events are of a psychical character, and Lamprecht conceives a given phase of civilization as 'a collective psychical condition (*seelischer Gesamtzustand*)' controlling the period, 'a diapason which penetrates all psychical phenomena and thereby all historical events of the time.' He has worked out a series of such phases, 'ages of changing psychical diapason,' in his *Deutsche Geschichte*, with the aim of showing that all the feelings and actions of each age can be explained by the diapason; and has attempted to prove that these diapasons are exhibited in other social developments, and are consequently not singular but typical. He maintains further that these ages succeed

each other in a definite order; the principle being that the collective psychical development begins with the homogeneity of all the individual members of a society and, through heightened psychical activity, advances in the form of a continually increasing differentiation of the individuals (this is akin to the Spencerian formula). This process, evolving psychical freedom from psychical constraint, exhibits a series of psychical phenomena which define successive periods of civilization. The process depends on two simple principles, that no idea can disappear without leaving behind it an effect or influence, and that all psychical life, whether in a person or in a society, means change, the acquisition of new mental contents. It follows that the new have to come to terms with the old, and this leads to a synthesis which determines the character of a new age. Hence the ages of civilization are defined as the 'highest concepts for subsuming without exception all psychical phenomena of the development of human societies, that is, of all historical events.' Lamprecht deduces the idea of a special historical science, which might be called 'historical ethnology,' dealing with the ages of civilization, and bearing the same relation to (descriptive or narrative) history as ethnology to ethnography. Such a science obviously corresponds to Comte's social dynamics, and the comparative method, on which Comte laid so much emphasis, is the principal instrument of Lamprecht."[14]

Working from the above premises Lamprecht has outlined what he regards as the great stages in the socio-psychological development of western civilization. The earliest or the primitive stage he designates as the "symbolic." This was superseded in the early Middle Ages by the "typical," that period of differentiation which produced various distinct types of culture. The later medieval period was the age of the "conventional" in culture, social life, industry, art, and religion. This was followed by the period of "individualism" from the Renaissance through the *Aufklärung,* an epoch in which, in the Protestant portions of Europe, the individual might hold direct communion with God, and was everywhere distingushed by great individual works of genius in science, art, literature, commerce, and politics. Beginning with the Romanticists and extending to the Industrial Revolution was the period of "subjectivism," characterized by the great emotional revolt against rationalism. The period since the Industrial Revolution is declared to be one of "nervous tension" in which mankind is still groping for a central ideal or a distinguishing socio-psychic

[14] J. B. Bury, "Darwinism and History," in the volume entitled *Evolution in Modern Thought,* Boni and Liveright's *Modern Library,* pp. 260-62. Some critics, notably Bernheim, have held that Lamprecht derived his views directly from Comte, but Lamprecht denies any such dependence and maintains the complete originality of his scheme, while admitting its similarity to Comte's. See his *What is History?* (1904), p. 157, note.

principle.[15] Though these stages or epochs have been the organizing principle of his voluminous *German History*, Lamprecht maintains that they are typical of social evolution in general among all peoples that have developed to the level of modern civilization.[16]

While Lamprecht's original method of interpreting historical material involved him in a bitter controversy with the conventional political and episodical historians,[17] he has received remarkable support from the more progressive German historians and patrons of learning. He has been enabled to establish the remarkable *Institut für Universal Geschichte* at Leipzig and has trained and inspired a large number of promising followers. Georg Steinhausen not only contributed many scholarly monographic studies on diverse phases of German cultural development, but, along with Walter Goetz also founded in 1903 the *Archiv für Kulturgeschichte*, a periodical devoted to advancing the cause of Lamprecht's type of historical interpretation. Kurt Breysig, in his *Kulturgeschichte der Neuzeit*, has extended the new methods to a monumental attempt to trace in a unified and coherent form the cultural evolution of the modern European world. Eberhard Gothein has ably defended the province, aims, and methods of the history of civilization and has himself made notable contributions to this field through monographs on the history of south Italian civilization and on the intellectual setting of the Renaissance. In addition to these writers, Lamprecht has exerted a deep influence upon many other European historians, as well as upon progressive historians in America, where, in 1904, he delivered in the form of a series of lectures his most extensive exposition and defense of his historical method and point of view.[18]

Besides these and many other unmentioned studies in *Kulturgeschichte* which have been more or less intimately related to Lamprecht's influences, many writers in other countries have presented surveys of cultural development which have stressed the psychological element. Among the more notable of these are Guglielmo Ferrero's "Greatness and Decline of Rome," Rafael Altamira's history of Spanish civilization, Alfred Rambaud's history of French civilization, Paul Milyoukov's survey

[15] Lamprecht, *What is History?* Lecture II.
[16] Ibid., Lectures IV-V.
[17] See G. P. Gooch, *History and Historians in the Nineteenth Century*, pp. 589-93.
[18] His *What is History?* delivered at the Congress of Arts and Sciences at St. Louis and at Columbia University.

of Russian cultural development Charles Seignobos' general survey of the history of civilization, and the elaborate general history of civilization prepared by the venerable and scholarly Swiss bibliographer of St. Gall, Otto Henne-am-Rhyn.

### 3. *The Defects of Lamprecht's System and Methodology*

While all who welcome a new and more fundamental approach to historical problems must recognize the great value of the work of Lamprecht in boldly staking out a relatively new field, must agree that he was fundamentally right in maintaining that the chief task of historiography from this stage in its development onward must be to discover through a study of the past how the civilization of the present has come about, and will probably accede to his thesis that the most promising phase of historical research with this end in view is the study of the transformations in the collective psychology through the ages, there is a very general trend among the more recent investigators in this field to doubt the complete validity of Lamprecht's specific interpretation of the course of history from the socio-psychological point of view. They feel that he was as much interested in trying to fit the facts of history into his original and suggestive scheme of historical development, which he had worked out in advance, as he was to discover how the present order of things has actually developed. The more critical converts to this new line of approach hold that the position of Lamprecht in the socio-psychological interpretation of history is highly comparable to that of Lewis H. Morgan and the unilateral evolutionists in the development of cultural ethnology. This group set forth what must always be regarded as the basic principle of their science, namely, that it should be concerned with explaining the cultural repetitions and identities, which were evident to the student, and with formulating the laws of cultural development. But instead of waiting for necessary data to be gathered through a patient intensive study of various cultural areas, they formulated in advance, from very imperfect knowledge, schemes of orderly and sequential development of culture and institutions and adapted the facts of ethnography, wrenched from their context, to bolster up their particular near *à priori* systems of evolutionary development. The more recent works of Ehrenreich in Germany; Marett and Rivers in England; Durkheim and his school in France; and, above all, Boas and his disciples in America, have demolished these logical and pretentious, but wholly unscientific ethnological card-houses, have

made it clear that only the most careful inductive study of ethnographic evidence will furnish the data upon which to base the laws of cultural development, and have rendered it equally certain that such investigation will demonstrate the futility of hoping to establish any simple unilateral evolutionary schemes of universal applicability.[19] The more critical workers in this field of historical interpretation believe that Lamprecht's work has suffered from this same fault. What Dr. Goldenweiser has said of Breysig's work will apply equally well to that of Lamprecht in its theoretical and methodological aspects: "In all such systems the discrepancies in the historical processes compared are never rated as theoretically on a par with the uniformities, nor as of equal significance. The discrepancies are either overlooked, thus involving a serious misrepresentation of the facts, or they are regarded as somehow less real or less deep than the uniformities, or they are brushed aside as 'disturbing agencies.'"[20] As the work of Boas and his followers in the United States has marked the most effective attempt to reconstruct cultural ethnology on a scientific and inductive basis, so, with the psychological interpretation of history, the most significant development of the more objective and scientific approach to this subject has been associated with the work of Professor James Harvey Robinson of Columbia University, and with that of the followers whom he has attracted in this country to the study of "intellectual history."

### 4. *Professor James Harvey Robinson and the Development of Intellectual History*

Professor Robinson accepts as the foundation of his approach to the study and interpretation of history Lamprecht's dictum that the historian should concern himself chiefly with discovering how the present has developed out of the past,[21] but he rejects absolutely the attempt to force the study and interpretation of the past into any such artificial and *à priori* scheme of cultural evolution as Lamprecht has devised. He would even reject as wholly unnatural and misleading, in view of the continuity of history, the conventional periodizing of

[19] See the references given above in note 7.

[20] A. A. Goldenweiser, "History, Psychology and Culture: A Set of Categories for an Introduction to Social Science," in *The Journal of Philosophy, Psychology and Scientific Methods*, Vol. XV, p. 589. This article is, perhaps, the most profound discussion yet contributed to the subject of the theoretical and methodological relationships of history and psychology.

[21] James Harvey Robinson, *The New History*, pp. 62, 78, 102-3.

the past as "ancient," "medieval," and so on, and will admit only a tentative division of intellectual development for heuristic purposes into the: Primitive, Ancient, Hellenic, Patristic, Scholastic and its decline, the *Aufklärung,* and the present age, since the industrial and scientific revolutions of the last century.[22] Believing with Lamprecht in the superior importance of the socio-psychic over the individual-psychic, and being an extremely ardent exponent of the doctrine of the continuity of history, he holds that the task of determining how the present world order has developed can best be solved by studying the changing attitudes of the intellectual classes from primitive times to the present day. By this he means not merely an investigation of the elaborate philosophical systems of isolated thinkers, but of the prevailing intellectual orientation and outlook upon life, in the broadest sense of that term, which has existed in various successive epochs from the earliest times. Being wholly inductive and non-schematic, his method of approach makes possible an unlimited adaptation to any new developments in either psychology or history. It also recognizes much more freely and fully than Lamprecht the influence that great personalities may have had in shaping the socio-psychic factors.

As Professor Robinson makes clear, this notion is not a new one but was ably and distinctly stated by Francis Bacon, who, indeed, a century hence may be looked upon as quite as much the harbinger of the "New History" as of the new inductive scientific method. In the following citation Professor Robinson quotes this significant passage from Bacon and offers his own comments upon its value to the modern historical student:—

"Lord Bacon in his *Advancement of Learning,* says: 'No man hath propounded to himself the general *state of learning* to be described and represented from age to age, as many have done the works of nature and the State civil and ecclesiastical; without which the history of the world seemeth to me to be as a statue of Polyphemus with his eye out; that part being wanting which doth most show the spirit and life of the person. And yet I am not ignorant that in divers particular sciences, as of the jurisconsults, the mathematicians, the rhetoricians, the philosophers, there are set down some small memorials of the schools, authors, and books; and so likewise some barren relations touching the invention of arts or usages. But a just story of learning, containing the antiquities and originals of knowledges and their sects; their inventions, their traditions; their diverse administrations and managings; their flourishings, their oppositions, decays, depressions,

[22] J. H. Robinson, *Outline Syllabus of the History of the Intellectual Class in Western Europe,* p. 28.

oblivions, removes; with the causes and occasions of them, and all other events concerning learning, throughout the ages of the world; I may truly affirm to be wanting.' . . . Bacon's reproach is still merited, for no one has as yet, so far as I know, ever clearly conceived of a general history of the chief opinions of the intellectual class.

"Yet what more vital has the past to teach us than the manner in which our convictions on large questions have arisen, developed and changed? We do not, assuredly, owe most of them to painful personal excogitation but inherit them, along with the institutions and social habits of the land in which we live. The content of a well-stocked mind is the product of tens of thousands of years of accumulation. Many widespread notions could by no possibility have originated in modern times, but have arisen in conditions quite alien to those of the present. We have too often, in consequence, an outworn intellectual equipment for new and unheard-of tasks. Only a study of the vicissitudes of human opinion can make us fully aware of this and enable us to readjust our views so as to adapt them to our present environment. If it be true that opinion tends, in the dynamic age in which we live, to lag far behind our changing environment, how can we better discover the anachronisms in our views and in our attitude toward the world than by studying their origin? Is not Bacon right in accusing the historian of presenting us with an image of the past without its great cyclopean eye, which alone reveals its spirit and life?"[22]

More than being merely the field of historical activity which seems far better adapted than any other to interpreting the significance of the past for an understanding of the present, intellectual history has a far richer and more extensive body of data than any other field. The volume of written records describing what man has been thinking of, or has avowed that he has been thinking of from the earliest times, exceeds beyond comparison the amount of historical information which has been preserved in any other field. Of the lives of the greatest figures in the history of culture and thought it frequently happens that little or nothing is known, while many volumes of their thoughts have been preserved. Further, intellectual history not only has at its disposal a vastly greater and more varied assortment of sources than any other branch of history but also, unlike that for any other phase of the subject, almost all of this information is of a sort which can be made use of with confidence by the historian. In an attempt to reconstruct the political history of the past, for example, the general tendency of a generation or an age to exaggerate, lie, distort accounts, ignore vital events in contemporary political life, or attribute political and military success or failure to miraculous causes would render the writings of such an age of almost no value to the political historian, while to the historian of the

[22] Robinson, *The New History*, pp. 101-3.

intellectual reactions of humanity it would have a high degree of value, for, as Seignobos has expressed it, "the psychological fact" exists unimpaired. The very prevalence of allegory, miracle-mongering, forgery, or general distortion of fact would constitute a problem of the utmost interest and importance for the historian of the psychological development of the race.

Finally, intellectual history not only best serves to explain the origins of the present but also constitutes the one completely disconcerting answer to the conservative who would invoke a misunderstood "human nature" and an ignorantly distorted history to aid him in resisting the onward push of the progress of mankind. This all important point has been very forcibly stated by Professor Robinson:—

"There is no space here to discuss the general relation of history to the causes and technique of progress, but a word may be said of the effect which our modern outlook should have on our estimate of the conservative mood. Mr. John Morley has given an unpleasant but not inaccurate sketch of the conservative, 'with his inexhaustible patience of abuses that only torment others; his apologetic word for beliefs that may not be so precisely true as one might wish, and institutions that are not altogether so useful as some might think possible; his cordiality towards progress and improvement in a general way, and his coldness or antipathy to each progressive proposal in particular; his pygmy hope that life will one day become somewhat better, punily shivering by the side of his gigantic conviction that it might well be infinitely worse.' How numerous and how respectable is still this class! It is made up of clergymen, lawyers, teachers, editors, and successful men of affairs. Doubtless some of them are nervous and apologetic, and try to find reasons to disguise their general opposition to change by taking credit for improvements to which they contribute nothing, or by forwarding some minor changes which exhaust their powers of imagination and innovation. But how rarely does one of them fail, when he addresses the young, to utter some warning, some praise of the past, some discouragement to effort and the onward struggle! The conservative is a perfectly explicable and inevitable product of that long, long period before man woke up to the possibility of conscious betterment. He still justifies existing conditions and ideas by the standards of the past rather than by those of the present or future. He neither vividly realizes how mightily things have advanced in times gone by, nor has he the imagination to see how easily they could be indefinitely bettered, if the temperament which he represents could cease to be artificially fostered. . . .

"Now it has been the constant objection urged by the conservative against any reform of which he disapproved that it involved a change of human nature. He has flattered himself that he knew the chief characteristics of humanity and that, since it was hopeless to alter any of these, a change which seemed to imply such an alteration was obviously impracticable. This argument was long ago met by Montaigne, who declared that one who viewed Mother Nature in her full majesty

and luster might perceive so general and so constant a variety that any individual and even the whole kingdom in which he happened to live must seem but a pin's point in comparison. But there is a wholly new argument now available. Whether the zoölogists are quite right or no in denying the possibility of the hereditary transmission of acquired traits, there is no reason to think that one particle of culture ever gets into the blood of our human species; it must either be transmitted by imitation or inculcation, or be lost, as Gabriel Tarde has made clear. We doubtless inherit the aptitudes of our parents, grandparents, and remoter ancestors; but any actual exercise that they may have made of the faculties which we share with them cannot influence us except by example or emulation. *Those things that the radical would alter and the conservative defend are therefore not traits of human nature but artificial achievements of human nurture.* Accordingly, the anthropologist and historian can rule out this fundamental conservative appeal to human nature by showing that the most extraordinary variety has existed and still exists in habits, institutions, and feelings of various groups of mankind; and the student familiar with the chief results of embryology will see that the conservative has constantly mistaken the artificially acquired and hereditarily non-transmissible for constant and unalterable elements in our native outfit. And, indeed it may be asked, if it has proved possible to alter an invertebrate tadpole-like creature living in the sea into an ape-like animal sleeping in a tree, and to transform the ape-like animal into an ingenious flint-chipping artist, able to paint pictures of bison and deer on the walls of a cave, and to derive from the flint chipper of the stone age a Plato able to tell a most edifying tale about a cave full of conservatives, what becomes of the argument for the fixity of human nature in any important sense?"[24]

Though this original and suggestive point of view, with its great emphasis upon the psychic factors in historical development, has gained no general acceptance among the conventional historians, its promise for the future can be gathered from the immense interest which Professor Robinson's lectures on the history of the intellectual class have aroused in recent years at Columbia University and the enthusiastic following he has developed among the younger and more progressive historians in this country. A considerable number of his students have made notable monographic contributions to various phases of intellectual history, and Professor Robinson is himself engaged upon a monumental synthesis of intellectual history which will not only illustrate his attitude towards historical interpretation but will also constitute the first comprehensive survey of the intellectual development of western civilization written from the standpoint of a scholar versed in the diverse trends of modern scientific thought, Dr. Draper's long popular work on "Intellectual Development" having been written too early to make use of the epoch-making progress in science and

[24] Robinson, *The New History*, pp. 253-58.

thought during the last forty years.[25] But if the significance of intellectual history has not as yet been consciously recognized by an extremely large number of historians, the amount of substantial work which has been done in this field is already enormous and, whether all of the writers have recognized it or not, constitutes the best possible vindication of intellectual history.[26]

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[25] The general scope of this work is forecast in Professor Robinson's detailed class syllabus entitled *An Outline of the History of the Intellectual Class in Western Europe*, pp. vii, 54. The most concise summary of his views is contained in Chapter IV of the *New History*. His point of view has also affected not only his own textbooks but those which have been written by his followers. See especially the acknowledgments in Lynn Thorndike's *History of Medieval Europe* and J. S. Schapiro's *Modern and Contemporary European History*.

[26] Only a few of the more notable works in this field can be mentioned here. From Great Britain have come E. B. Tylor's researches in primitive thought; the works of J. P. Mahaffy, Gilbert Murray, and Samuel Dill on classical thought; Rashdall's study of the medieval university; R. L. Poole's brilliant excursion into medieval thought; W. E. H. Lecky's precocious but brilliant analysis of the development of rationalism in modern times; John Morley's comprehensive appreciation of the writing of the 18th century rationalists in France; Leslie Stephen's monumental survey of English thought in the 18th and 19th centuries; A. W. Benn's history of modern English rationalism; J. T. Merz's massive and scholarly exposition of the progress of European science and thought during the last century; the brilliant and courageous attacks upon obscuranticism which have been produced by Karl Pearson, J. B. Bury, J. M. Robertson, Joseph McCabe, T. H. Huxley, and Edward Clodd; the enduring contributions of Ernest Barker, J. N. Figgis, G. P. Gooch, A. J. Carlyle, W. Graham, D. G. Ritchie, Frederick Pollock, and Thomas Kirkup to the history of political theory; the studies in the evolution of economic thought by W. J. Ashley, James Bonar, Edward Cannan, J. K. Ingram, and Henry Higgs; the surveys of historiography by J. B. Bury, James Gairdner, Lord Acton, and G. P. Gooch; the investigations of the history of science by Karl Pearson, A. E. Shipley, W. C. D. Whetham, Ray Lankester, and J. A. Thompson; the history of legal ideas by James Bryce, Frederick Pollock, Edward Jenks, and F. W. Maitland; the surveys of the development of religious thought by E. B. Tylor, J. G. Frazer, R. R. Marett, Robertson Smith, Jane Harrison, L. R. Farnell, Warde Fowler, T. R. Glover, F. C. Conybeare, H. B. Workman, J. E. Carpenter, and C. Beard; and the studies in the history of aesthetics by J. A. Symonds, John Ruskin, J. P. Mahaffy, and Gilbert Murray. Germany has contributed the massive works of Edouard Zeller, Ulrich Wilamowitz Möllendorff, and Theodor Gomperz on the history of Greek thought; the brilliant and original work of Wilhelm Dilthey and Wilhelm Windelband on the history of philosophy; W. Wundt's schematic survey of the development of culture from a socio-psychological point of view; the works of Rohde, E. Aust, G. Wissowa, Adolph Harnack, Karl Hase, and Ernst Troeltsch on the development of religious thought; the monumental treatments of the history of law and

### 5. *The Discovery of the Importance of the Unconscious Motives and Impulses in Psychic Life and its Significance for the Psychological Interpretation of History*

Within the last few years, however, there have been discoveries and advances in psychology which are of such far-reaching importance and of so revolutionary a nature that they threaten the well-nigh total discrediting of the conventional historical literature, in so far as it touches individuals and their motives, and would seem to indicate the necessity of reconsidering much of even the most advanced socio-psychological interpretation of history. These phases of psychological progress to which reference is made are those connected with the discovery of, or the new emphasis which is placed upon, the importance of the instinctive, subconscious and unconscious impulses or motives in human conduct. These developments, while vaguely anticipated at an earlier date, are chiefly associ-

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politico-legal theories by Otto Gierke, H. Brunner, R. Ihering, and R. Sohm; the studies of historiography by F. Wegele, E. Bernheim, and G. Wolf; the histories of sociological thought by Paul Barth and Ludwig Stein; the investigation of the history of science by E. Du Bois-Reymond, E. Mach, W. Ostwald, and F. Dannemann; and the studies in the history of aesthetics by Burckhardt, Gervinus, Gregorovius, Woltmann, and Lübke. France is represented in this field by the various monographic studies of the development of thought by L. Lévy-Bruhl; the brilliant contributions of Durkheim and his school to many phases of intellectual history; the encyclopedic publications of Solomon Reinach on every phase of the history of culture; J. Delvaillè's monumental work on the history of the concept of human progress; the works of A. Franck, E. Faguet, and Paul Janet on the history of political theory; Gide and Rist's notable survey of recent economic and social theory; the contributions of A. Bouché-Leclercq, G. Boissier, E. Renan, L. Duchesne, A. Loisy and E. Chénon to the development of religious thought; the studies in the history of science by Émile Boutroux, Gaston Milhaud, P. Duhem, and P. Tannery; and the work in the field of the history of aesthetics by Renan, Sainte-Beuve, Taine, Faguet and Reinach. Italy has been honored by the contributions of Benedetto Croce to the history of thought. The Scandinavian nations have produced able students in this field such as Harald Höffding and Georg Brandes. Belgium is ably represented by the contributions of Georg Sarton to the history of science, of Franz Cumont to the history of religion, and of G. De Greef to the history of sociological and political thought. In America the field of intellectual history was earliest cultivated by John W. Draper, whose works have long since become antiquated. Draper was followed by President Andrew D. White, whose vigorous assault upon obscuranticism was the most powerful influence in bringing the educated American public into proper orientation with the progress of modern science, thought, and criticism in nearly every field. Henry Osborn Taylor has produced a scholarly survey of European thought to the close of the Middle Ages. Professor G. L. Burr

ated with the work of G. Stanley Hall, Thorndike, McDougall, Trotter, Shand, Janet, Morton Prince, and Freud, Jung, Adler, Jones and the others of the so-called "psycho-analytical school."[27] It was once confidently supposed that man is fully conscious of the impulses which move him to action, that if a person honestly avowed that he acted from certain motives there could be little doubt that he did so. If these premises were accepted, the task of the historian in establishing the facts in the case was the relatively simple one of determining the degree of honesty and candor in the statement. It has now come to be almost universally agreed, however, that even so much of this newer dynamic psychology as is beyond the least probability of error in fundamental principles, has demonstrated beyond any possibility of doubt that the great majority of human psychic reactions are produced by impulses or motives that are below the level of consciousness — that emerge unknown from the unconscious sources of

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has devoted himself to a study of the history of superstition and the growth of toleration. Professors Dunning, Merriam, and Scherger have done notable work in the field of the history of political theory. Professors W. C. Abbott and W. R. Shepherd have indicated the reaction of the Commercial Revolution on European thought and culture. C. H. Toy, G. F. Moore, M. Jastrow, J. H. Breasted, R. W. Rogers, C. H. Moore, J. B. Carter, G. Fisher, G. S. Hall, N. Schmidt, A. C. McGiffert, E. C. Moore, and E. W. Hopkins have studied diverse phases of the development of religious thought. Lynn Thorndike, W. T. Sedgwick and W. Libby have dealt with the history of science. Roscoe Pound has shown the relation of the history of law to the general development of ideas. Finally, the history of aesthetics has been investigated by Charles Eliot Norton, Emily James Putnam, and Ralph Adams Cram. This vast mass of highly scholarly analysis of all phases and periods of intellectual history, together with the great volume of original sources bearing upon this subject, present to the progressive historian a field for productive work which is indeed inviting.

[27] We have no systematic history and analysis of the development of the psychology of instinctive and unconscious mental activity. W. McDougall's *Social Psychology*, E. L. Thorndike's *The Original Nature of Man*, Maurice Parmelee's *Personality and Conduct*, and Isadore Coriat's *Abnormal Psychology* cover the field fairly well. For the history of the psychoanalytic movement see P. C. Bjerre's *The History and Practice of Psychanalysis* and S. Freud, *The History of the Psychoanalytical Movement*. The best elementary presentation of psychoanalysis is to be found in W. Lay's *Man's Unconscious Conflicts;* I. Coriat's *What is Psychoanalysis?* and W. A. White's *The Mechanisms of Character Formation*. For a more detailed study consult the works mentioned in the Introduction to Lay's book. Current developments in this field may be followed in the *Mental Hygiene Magazine* and the *Psychoanalytical Review*.

psychic life and power.[28] A much worn, but illuminating figure compares the psychic life and activity of man to the iceberg, with a great submerged mass of unconscious impulses and motives, and a relatively slight visible portion of conscious activity. Singularly enough this newer psychology is of particular importance for the older type of historian who believes historical events to be the product of the activity of the great personalities, to be based upon the element of the individual-psychic. This newer psychology must be admitted definitely to demonstrate that the older biographical historical literature is of little value, except in so far as it has brought together the information which will enable the historian of the future, armed with the necessary psychological knowledge, to interpret its real significance.

It would be easy, however, to overestimate greatly the degree to which this interesting advance in psychology can be utilized by the historian, as well as to be over-optimistic as to the rapidity and assurance with which it can be assimilated by the ambitious historian. In the first place, the new psychology of the unconscious is in its present state of development, at least, primarily a system of individual psychology. As the Carlylian interpretation of history in terms of the great personalities has suffered a serious eclipse during the last half century in favor of the socio-psychic interpretation, a type of psychology which leans distinctly towards the psychology of the individuals has its serious limitations as a mechanism for a complete interpretation of historical development. Again, few historians will take the time needed to acquire any reliable knowledge of the newer psychology, and probably even fewer psychologists will care to master the detailed facts of history. Further, it is only concerning personalities of recent times that we possess that volume of intimate information which would make it possible to gain even the most general knowledge of the unconscious motives of their psychic activity. Among figures from ancient times Cicero alone would furnish anything like enough evidence to make it possible to determine his complexes. Of all the Patristics, Augustine was the only one sufficiently introspective and voluminous in his

[28] With the exception of a few antediluvian organic neurologists and a still smaller number of academic psychologists, afflicted with an acute "defense-reaction," this fact is undenied by any informed student of present day psychology. It stands whether or not one accepts the Freudian mechanisms with which it is maintained that the skilled psychoanalyst can explore the unconscious. A denial of Freudianism in no way involves an elimination of the reality of the unconscious.

self-revelations to invite a fruitful psychoanalysis. Petrarch would probably be regarded as the first remarkable case for study by psychoanalysis as his "Confessions" have been designated by Professors Robinson and Rolfe as "the earliest unmistakable example of cool, fair, honest, and comprehensive self-analysis that we possess." Since the invention of the art of printing in the 15th century the mass of evidence dealing with historic personalities has become much more voluminous, but it is doubtful whether the most extensive and scholarly biography of the present day will furnish enough evidence to get very deeply into the subconscious motives of the individual being investigated. It must be remembered that it is difficult for the most skillful practising psychiatrist to get far enough into the patient's unconscious to secure enough data to effect a cure without from fifty to one hundred hours of direct personal questioning, and it is not to be supposed that the most complete biography, diary, or autobiography would present anything like that amount of direct personal information. Then, it must be remembered that the tendency of conscious expression, which makes up the greater part of written or spoken records, is towards the displacement, rationalization, projection, symbolizing or otherwise disguising of the real dynamic motives and impulses in the unconscious. Thus, the motives or reasons assigned for his particular act or policy, by the most honest and reliable individual may be, and, indeed frequently would be, as far from the real truth as the statement of the most notorious liar of his generation.

While these severe limitations upon the application of the new dynamic psychology of unconscious motives to the extension of our knowledge of the great personalities of history may seem rather disconcerting to the over-enthusiastic adherent to the more advanced psychological concepts and methods, it is only by keeping them well in mind that work in this field can be restrained from straying from the realm of probable facts of great value into the region of the fantastic and grotesque; in short, from history into poetry. But within these limitations this recent development of psychology, which has revealed the potency of the unconscious in mental life and has furnished us with at least a preliminary and tentative set of mechanisms for exploring the unconscious, can render the greatest service to history. It will certainly enable the historical student who is well grounded in the new psychology to bring out clearly the general character types,

and in many cases to disclose at least the major determining complexes of the leading individuals in history concerning whose personal life, thoughts, and activities any considerable body of evidence exists. It has now come to be a cardinal principle of dynamic psychology that the individual is a "creature of his complexes,"[29] and it is quite evident that without a knowledge of the complexes of an individual we can know little of the real motives and forces which influence his action. Psychology today completely rejects the notion that a certain stimulus of a given sort will affect all persons alike, but rather proves that the effect of the stimulus upon the individual will be in accordance with his complexes. It may be objected that this type of psychology applies chiefly to the abnormal types of man and that the great mass of normal individuals are affected by few or no subconscious complexes. While this position could scarcely be wholly accepted, it would at any rate have little bearing upon the question under discussion. As far as progress has been dependent upon the work of individuals, it has come from the contributions of the abnormal types, and the great mass of "normal" beings are born, live, and die in general "psychic ease and comfort," but without having contributed an iota to civilization and its further development.[30] The modern psychological historian who accepts the Carlylian interpretation of history will need to revise the famous phrase that history is "collective biography" to read that history is the record of the "collective sublimation of the neuroses and psychoses" of the great personalities of history. It becomes, therefore, quite evident that we can in no way escape the task of applying the new psychological mechanisms to the study of the leading personalities, at least to those in modern times, where we have some adequate body of evidence to serve as the basis for investigation. It is undoubtedly true that we can pass but little beyond the borderland of exploration in the unconscious of the most of the significant personalities, but we must certainly recognize that without knowing something of their basic complexes our knowledge of the real significance and causation of their thoughts and actions will be most imperfect. Surely no genuine and

[29] Modern psychology quite reverses the old adage that "as a man thinketh so is he." Rather is it true that as a man's complexes are so will he think.

[30] This fact, with its psychological explanation, is well brought out in the opening chapters of W. Trotter's *The Instinct of the Herd in Peace and War.*

conscientious historian will stop short of the impossible in the search for the last available item of vital information which will help to clear up our understanding of the past.

If one accepts the view that a knowledge of their complexes is essential to a complete understanding of the motives and impulses which have governed the actions of prominent personalities, then he must take a radically different attitude than is conventional towards the intimate personal experiences of the individual whose life is being examined. In the usual run of biographical writing the intimate private life of great personalities is either ignored entirely or set forth in a way designed to extol certain alleged virtues or obscure definite shortcomings of character. A candid revelation of every fact in the private experiences of a leading personality which will throw any light upon the sources of his impulses and activity is normally branded as scandal-mongering and stigmatized as evidence of gross bad taste, except when utilized by some noble patriot for partisan purposes in a presidential campaign. Especially subject to this restrictive taboo are those experiences of the individual in the sexual realm, the discussion of which mortally offends our venerable "impurity complex." Now the student of modern dynamic psychology finds that he must vigorously oppose this conventional procedure, for he knows that these tabooed private experiences are exactly what need to be known if we are to obtain some comprehension of the complexes of the individual. Even private sexual experiences cannot escape the scrutiny of the psychological historian in the pursuit of adequate biographical knowledge. George Washington's complexes cannot be gleaned from the story of the "cherry tree" or an account of his prayers at Valley Forge any more than Senator Dilworthy's speech before the Sunday school would reveal the life history or political intrigues of this famous character in Mark Twain's *Gilded Age*. It may well be held that incomplete information or imperfections of knowledge are greatly to be preferred to delving into that area of secrets and privacies which the historian has previously avoided or failed to utilize, but the acceptance of such an attitude should carry with it a frank confession that no vital interpretation of fundamental importance can be expected. It must further be recognized that even though the psychological historian is willing to waive the canons of conventional good taste in the interest of more complete historical knowledge, much of this information regarding the private life, especially the uncomplimentary or unsavory episodes, of

important personalities either has never found its way into documentary evidence or has been destroyed by reverent literary executors. The way of the psychological historian in the mazes of interpretative biography must inevitably be hard, like that of the proverbial transgressor.

Space does not here allow any serious attempt to analyze any of the great personalities of history, nor even to call attention to significant work already done in this field, but it may be of interest to direct attention to obvious instances where a detailed analysis of personalities on the basis of the mechanisms of the newer psychology would be, or has been, particularly fruitful. Nothing has been more consequential for the subsequent intellectual and social history of mankind than Augustine's notorious "impurity complex," which he fastened upon European thought so successfully and so deeply that we have not yet recovered from it. Even our archaic anti-birth-control legislation directly reflects its influence. It is now well understood that this was wholly a psychic compensation for Augustine's own wild youth and his varied and extensive sexual experiences. The psychoanalyst would have little difficulty in grasping the significance of Abelard's abnormal tendency towards doubting, his revolt against the authority of the Church Fathers and contemporary theologians, his inability to meet the adult sexual situation in matrimony, and his compensation in a near "delusion of persecution." Petrarch's abnormal introspective tendency has already been pointed out. The strange and mysterious character of that unique genius, Leonardo da Vinci, has inspired a study by the founder of psychoanalysis.[31] Luther's tremendous mental conflicts in early life, and their final culmination in his open revolt against the "Holy Father" and in his zeal for "devil-mongering" cannot be fully understood except when dealt with in terms of dynamic psychology.[32] One would like to know more about Voltaire's revolt from authority in the light of the psychology of his youthful experiences. Rousseau's whole literary and philosophical product is little more than a continuous sublimation of typical neurotic symptoms. That Napoleon was an epileptic is well known, and the chief source of his immense power and energy may well have been that unusual contact with the dynamic force in his unconscious,

[31] S Freud's *Leonardo da Vinci.*

[32] See Preserved Smith's original and scholarly article on "Luther's Early Development in the Light of Psychoanalysis," in the *American Journal of Psychology,* July, 1913, pp. 360-377.

concerning which William James wrote so clearly and forcefully.[33] Further research along this line may confirm the hypothesis that the great exponents of anarchy and individualism have elaborated their philosophy as an outlet for their repressions or as a revolt from authority. The derivation of both Kropotkin and Bakunin from autocratic and militaristic Russian society is a well-known and much commented upon fact. It is, further, common knowledge that the great individualists of the last century, Jefferson, Spencer and Mill, passed their childhood under an abnormally complete and severe domination and control by their male parent or some older male relative — the ideal situation for the development of a violent anti-authority complex. It is not unlikely that we shall one day learn that the obsessed attachment of Cecil Rhodes and Rudyard Kipling for the British Empire, symbolized by Britannia, was motivated by an exceedingly vigorous mother transference. Our own history furnishes ample evidence of the pressing need for a reconsideration of the traits of our leading personalities in the light of the newer psychology. Washington with his interesting "Jehovah complex," combining Olympic detachment with a Jacksonian temper; the utterly abnormal love of Hamilton for an authoritative political system and his accompanying fear of anarchy, which was in its intensity almost comparable to the well known phobia of open places; the violent anti-authority complex of Jefferson and its attendant feeling of inferiority, both of which were elaborated and defended in ten thick volumes of letters and public documents; the remarkable development of a "spotless soul" in James Monroe after his part in many questionable episodes such as the violation of his word in the publication of the Reynolds letters; the sadism and the "Jehovah complex" of Andrew Jackson, who was so intolerent of opposition as to be unable to complete a sentence in public debate without choking with anger; the love that Douglass possessed for union and authority which led him to break with the secession element in his party; Lincoln's hatred of slavery, his unusual tenderness for the oppressed, and his intense periodic depressions;[34] Thad Stevens' great concern over the freedom of the southern negro, while he led in the oppression of the southern whites and utilized the reconstruc-

[33] Especially his *The Energies of Men.*

[34] A comprehensive study of Lincoln's major complexes has been made by Dr. L. Pierce Clark in a paper read before the New York Psychiatric Society, March 5, 1919.

tion legislation to give a constitutional protection for corrupt and grasping business interests in the north; the "psychosis of sanctimony" which could bear the Crusader from Lincoln, Nebraska, unabashed through the slough of agrarianism and free-silver; the remarkable combination in Roosevelt of a Hamiltonian zeal for the "Big Stick" with an almost Jeffersonian sensitiveness to public opinion; and the Jovian aloofness, the procrastinating opportunism, the frequent, repeated and vigorous declarations of reliance upon the "best counsel of the nation," the continual shifting of position upon fundamental points, the defence-reaction in the choice of a cabinet of inferior calibre, the ostentatious parade of public virtue and well-advertized prayers in company with the Secretary of State, which characterize our present Chief Executive, are but a few interesting cases in which the newer psychology can contribute very greatly to a more complete mastery of American history.

While it must be always kept in mind that the psychology of the unconscious is in its present development primarily a system of individual rather than social psychology, it can also throw at least some light upon certain problems of more general or mass psychology.[35] Notwithstanding the contrary doctrines of Durkheim, it must be agreed that the social mind is at least based upon the individual minds in the group, even though it may be something quite different from the mere sum of those minds. Therefore, it is obvious that a new psychological discovery of such great import for individual psychology as the demonstration of the significance of the unconscious factors in mental life could not but be of interest to the student of the more general problems of the development of thought and culture.

In the field of the history of religious phenomena the new dynamic psychology can be of great aid in clearing up many hitherto perplexing or misinterpreted problems. The unconscious symbolism involved in primitive religion, mythology, art, and ritual has been ably analyzed by E. Crawley, Jane Harrison, and Gilbert Murray but needs a much more

[35] For a scholarly and lucid exposition of the limitations upon at least the Freudian psychology as a system of social psychology I am indebted to an unpublished address of Dr. A. A. Goldenweiser before the Psychological Club of Columbia University, 1918. Perhaps the most ambitious attempt to extend Freudian psychology to an interpretation of socio-psychological phenomena is Freud's *Totem and Taboo.*

thorough analysis.[36] G. Lomer, Binet-Sanglé, H. Schaefer, and especially G. Stanley Hall, have shown how much modern psychology can contribute to a better understanding of the personality of Christ and of the derivation and significance of his teachings.[37] The deeper psychological significance of the symbolism in the sacramental system of the Catholic Church is a fertile problem awaiting a more complete investigation than has been accorded to it by Conybeare and others. The reasons for the phenomenal grip of the Catholic Church upon its communicants can never be wholly appreciated until one reflects that with its combination of the Papacy and Mariolatry it provides for an unique dual "transference" of the filial and sexual attachments of both female and male children to the "Holy Father" and the "Holy Mother," respectively. There can be little doubt that this fact, together with the well-established thesis of genetic psychology that attachments formed in childhood are much more vital and tenacious than those of later life, go further towards clearing up the problem of the strength of Catholicism than the important matter of its extensive organization. This also explains how a Catholic may be a violent radical in politics and yet retain a fervent devotion for the Church and its dogmas and ritual. The revolt against the political authority is an unconscious revolt against the male parent, while the Church symbolizes to the male believer his mother and thereby wholly escapes his anti-authority reaction. To the Protestant, on the contrary, with his chief emphasis on the Old Testament and its patriarchal religious concepts, and his rejection of Mariolatry, both Church and State symbolize the authority of the male parent and are rejected together. Again, only in the light of the newer psychology of the unconscious can one understand how the Catholic clergy has been able, when it has actually done so, to observe successfully the vow of chastity. It is a well-known principle of psychoanalysis that the blocking of the normal outlet for adult sexuality leads to a reversion to an infantile sexual level, and in the case of the male adult to a revival of

[36] A study along this line has been made by Dr. Karl J. Karlson, "Psychoanalysis and Mythology," in the *Journal of Religious Psychology*, November, 1914. See also C. G. Jung's *Psychology of the Unconscious.*

[37] G. Lomer, *Jesus Christus vom Standpunkte des Psychiaters* (1905); Binet-Sanglé, *La Folie de Jésus* (1908); H. Schaefer, *Jesus in Psychiatrische Beleuchtung* (1910); G. Stanley Hall, *Jesus the Christ in the Light of Psychology*, 2 Vols. (1917). See Hall, pp. 162ff. for a discussion of these psychological studies of Jesus.

infantile sexual attachment for his mother. In this manner the symbolism and ritual of Mariolatry have proved a veritable godsend to the Catholic clergy, for it has both strengthened their attachment for the Church and afforded a means of sexual release. In the intimate association of the semiclub life of the monastic orders at least a psychic homosexuality has also served as a means of aiding in the process of diverting the sexual impulses from their normal outlet. Further, the phenomenon of religious conversion was inexplicable until it was definitely shown that this was the result of breaking through psychic resistances and tapping the vast stores of new vital energy in the unconscious.[38] This, of course, throws light not only upon the problem of conversion in general but also upon the great historic instances of conversion like those of St. Paul, Augustine, St. Francis, and Loyola. Finally, while it has long been a common saying that a man's ability to drive a close bargain in a commercial transaction was directly in proportion to the length and resonance of his public prayers, it has only been since we have understood the mechanism of psychic compensation that we have known the scientific reason why excessive and ostentatious piety is normally correlated with hypocrisy.[39]

That neither the nature nor the history of art and literature can be understood in any fundamental sense unless they are viewed primarily as the sublimation of the complexes of the great authors and artists is generally admitted. Indeed, it is very generally agreed that the successful aesthetic temperament is one in which the individual is in particularly close contact with, and in relatively full control of, his store of subconscious energy and impulses. This field has already been profitably explored in a number of suggestive analyses of leading artists and authors, and a general summary of the subject in its relation to literature has been made in the interesting work of Mr. Albert Mordell.[40] It seems to be equally clear

[38] It has also been shown that the acceptance of God or Christ in conversion is partly a readjustment to the authority of the earthly parent as well as to that of the Heavenly parent.

[39] In the light of this one should read Upton Sinclair's *The Profits of Religion.*

[40] *The Erotic Motive in Literature.* This work is severely criticized for its excesses by Francis Hackett in *The New Republic* for July 2, 1919, pp. 287-8, but Mr. Hackett freely recognizes the great value of the Freudian psychology for the interpretation of the motives of leading authors. No equal study has been made of the unconscious basis of art, but Jung's *Psychology of the Unconscious* devotes some space to this subject.

that unconscious impulses are often the causative factor in scientific investigation. The recent careful study of the notebooks of Leonardo da Vinci has demonstrated that he was probably the most unique and remarkable genius in the history of science, and Freud had shown convincingly that his inordinate scientific curiosity was but a sublimation of the blocked and unsatisfied sexual curiosity of his youth.

The importance of the psychological factor in politics has long been recognized; Hume and Adam Smith, for example, comprehended many important psychic elements underlying government and political association, and since their day the literature in this field has been continually expanding, having been especially associated with the development of the different phases of social psychology.[41] But it is now coming to be realized that no sound psychology of political activity can ignore the recent developments in the psychology of instincts, behaviorism, and the unconscious. As a recent writer has very well said:—

"This aspect of our teaching is perhaps best illustrated by our failure adequately to emphasize the importance of psychological analysis. We are, after all, dealing with an eminently human set of facts; yet there are few teachers who emphasize the impossibility of understanding political phenomena without a grasp of psychology. There are, indeed, few who do not know the change in perspective since Mr. Wallas drove the Benthamite psychology out of the political field. But, to take an obvious instance, we cannot explain the very fact of political obedience unless we are fully equipped with the latest knowledge psychology can offer. Do men obey, as Hobbes said, through fear? Is the real basis consent, as with Rousseau; or habit, as with Sir Henry Maine? The answer to this, and all kindred questions, we shall only know if we try fully to grasp and cautiously to apply, the things we are being taught by men such as Freud and Jung, McDougall and the behaviorists. It ought to be understood that no student is equipped for serious political analysis except upon the basis of a thorough acquaintance with these studies."[42]

How fruitful and suggestive the analysis of political activity and institutions can be when based upon the new dynamic psychology has been well illustrated by Walter Lippmann's "Preface to Politics" and Graham Wallas' "Human Nature in Politics" and "The Great Society." It should be clear that these underlying psychological factors are as important for an understanding of political history as they are for an analysis of current political theories and problems.

[41] See Ernest Barker's *Political Thought from Spencer to the Present Day*, pp. 148-158. Probably the most suggestive book in this whole field is E. A. Ross's *Social Control*.

[42] *The New Republic*, March 1, 1919, p. 135.

While the limitations upon a direct transference of concepts applicable to the individual-psychic phenomena into the field of the socio-psychic must be recalled, there is little doubt that the basic Freudian concept of repression can be utilized to great advantage in explaining the problems connected with political revolutions.[43] In much the same way that excessive and prolonged repression of normal impulses in the individual tends to issue in an explosion in a neurosis or psychosis, so long-continued oppression of any economic, social, or political class is likely to lead to that violent eruption conventionally known as a revolution. The revolt of the peasantry in England at the close of the Middle Ages, and in Germany in Luther's time, the French Revolution and the insurrection of the June Days of 1848 are historic examples which have been often cited in this connection, but probably no other instance in history is quite as pertinent as the contemporary Russian revolution with its unparalleled proletarian upheaval. Mr. Graham Wallas has shown the significance of social repression in producing a general prevalence of what he calls "baulked dispositions."[44] The late Professor Carleton H. Parker made it clear how the I. W. W. movement in this country is primarily a socio-psychic revolt against intolerable conditions forced upon the working classes in factories, mines and lumber camps.[45] Mr. Ordway Tead has provided a useful summary of the normal human instincts which should find an outlet if the laboring class is to live a happy or contented life, and has made clear how far most of these instincts are from satisfaction in the modern industrial and political order. If we accept the results of this suggestive line of work as valid, it must be agreed that most of the great revolutionary upheavals of the past were caused primarily by a psychic explosion after the duration, volume, and acuteness of the repression of the lower class had become no longer endurable. Not only do the revolts against the established order have a vital psychic content, but schemes of social and political reform, like the plots of novelists, are sublimations of the complexes in the uncon-

[43] No good psychological study of revolutions has yet been provided. LeBon's ambitious attempt aims primarily to substantiate his own views on social psychology by applying them to the data of the French Revolution and is generally unscientific and unsatisfactory.

[44] *The Great Society*, pp. 57ff.

[45] See his article on the I. W. W. Movement in the *Atlantic Monthly* for November, 1917.

scious of the reformer.[46] Again, in spite of the frenzied attempts of sociologists and publicists to rationalize the patriotic emotion, no fact could be better established than that patriotism owes its tremendous grip over the human mind to its symbolic power to throw back the mind upon that age-old instinct of group self-preservation.[47] Finally, as every profound student has freely recognized, the Great War has been from its background to the setting and procedure of the Peace Conference most fundamentally a psychological product, and no hope of an enduring peace can be rationally held unless a favorable psychological environment is created.

The significance of the modern dynamic psychology for the study of the evolution of social groups and institutions should be readily apparent. The late Professor William Graham Sumner, in his scholarly, suggestive, and comprehensive work on "Folkways," has shown how the fundamental guide to social conduct in every field is that vast mass of "folkways" and "mores" which have been reduced by habit and repetition to an almost instinctive level, thus making society extremely coercive in enforcing their observance.[48] Sumner did not, however, make sufficiently clear the deeper psychological processes through which these group habits became instinctive guides and channels of social conduct. It remained for the English surgeon and social psychologist, Wilfred Trotter, to analyze the nature and effect of that "herd-instinct" which has developed as a result of man's having depended for survival and progress upon his life in a social group, which could not have existed and endured without such discipline of its members as was required to give cohesion, unity, and direction to the group. This herd instinct is, however, not merely the basic psychic force preserving and compelling obedience to the folkways and mores, but is also the great factor in enforcing upon the individual mind those repressions of individual impulses and initiative which cause mental instability among so large a proportion of the population. Never before was the psychological basis of conservatism so clearly set forth nor its fundamentally instinctive rather than intellectual nature so

[46] Cf. Miss Blanchard's article "A Psychoanalytical Study of Auguste Comte," *American Journal of Psychology*, April, 1918, pp. 159-181.

[47] Cf. Professor F. H. Hankins, "Patriotism and Peace," Founder's Day Address, Clark University, 1919, *Clark College Record*, April 1919, pp. 114-121.

[48] William Graham Sumner, *Folkways*, particularly Chaps. I-II, XI, XV.

clearly proved.[49] Further, it would seem that the modern notions of unconscious factors in psychic life and their relation to group activity furnish the only possible means of reconciling the theory of Durkheim and his school that the social mind is the chief creative force in culture with the doctrines of those who emphasize the all-important nature of individual genius, initiative, and invention.[50] The psychic exuberance and stimulation which comes from close and intimate association in the social group probably results from the fact that this reversion to the intimate contact which characterized primitive life puts all the individuals in the group in a more direct contact with the store of psychic energy in their unconscious. It might be objected that this does not touch the matter of those inventive geniuses who have carried on their work in isolation, but it would seem safe to hold that they are only the few exceptions who prove the rule that man's mental activity and enthusiasm for creative work is normally far greater when in intimate association with those engaged upon a similar quest than in isolation.

There remain to be considered the psychological factors underlying the economic elements in social life. The economic interpretation of history has long been regarded as the last and most effective bulwark of philosophical materialism. Countless pretentious volumes have been directed against it by alarmed idealists and not a few historical scholars have conducted similar attacks.[51] But even before the psychology of the unconscious was generally understood many students of economic history had ceased to claim a primacy for the economic factor as compared with all other elements which make for progress and development, and had held that the psychic factor was obviously the dominant element, though economic processes and institutions might exert a most important influence upon the psychological factors. In a recent able and suggestive paper Professor William F. Ogburn has carried this line of analysis still further and has pointed out the vital significance of unconscious psychological factors in the field of economic motives and activity. He has shown,

[49] W. Trotter, *Instincts of the Herd in Peace and War.*

[50] See Durkheim's *Elementary Forms of Religious Life.* The contrary view is held in Faguet's *Cult of Incompetence;* W. H. Mallock's *Aristocracy and Evolution;* and R. A. Cram's *The Nemesis of Mediocrity.*

[51] Especially Shailer Matthews in his *The Spiritual Interpretation of History,* and E. D. Adams in his *The Power of Ideals in American History.*

among other things, how the economic motives are commonly disguised through the operation of such unconscious mechanisms as displacement, symbolism, projection, compensation, and rationalization.[52] If his thesis is to be accepted, as it certainly may be in at least a tentative way, it would indicate that the economic factors are more all-embracing and far-reaching than was earlier supposed. In this connection there should also be mentioned the work of Mr. Tead already referred to regarding the importance of instinctive psychic reactions in economic life [53] and the brilliant if incomplete work of the late Professor Parker on both the instinctive and the unconscious psychic factors which lie at the basis of economic life and activity.[54] Thus, it can no longer be denied that even the economic factors in social life cannot be understood in any adequate, fundamental, or dynamic manner without a consideration of these problems in the light of the newer psychology.

Familiar illustrations from the history of our own country will bear out the assertion that the modern psychological mechanisms will go far towards interpreting more clearly those general policies and attitudes which have played a dominating part in our national history. How far, for example, was the austere impurity complex of the "glacial age" of New England Puritanism a psychic compensation for economic chicanery in smuggling and the rum trade? How far, again,

[52] William F. Ogburn, "The Psychological Basis for the Economic Interpretation of History," a paper read before the thirty-first annual meeting of the American Economic Association, December, 1918. Printed in the *American Economic Review*, Supplement, March, 1919, pp. 291-305. The tremendous resistance which the newer psychological concepts meet even from original and progressive thinkers may be gleaned from the discussion of Professor Ogburn's paper by Professor Frank Fetter, unquestionably one of the most original of American economists and the most vigorous exponent of the conventional psychological economics. He contemptuously dismissed the Freudian psychlogy as a "degenerate psychology," giving as his only definite reason the fact that it is rejected by "a number of psychologists and philosophers of the best standing." It was curious that he did not remember that two decades earlier his own now generally accepted views on psychological economics were rejected by most American economists "of the best standing."

[53] Ordway Tead, *Instincts in Industry*.

[54] See his paper on "Motives in Economic Life," read before the American Economic Association, 1917, published in the *American Economic Review*, Supplement, March, 1918. See also his charming biography by his wife, entitled *An American Idyll*, published by the *Atlantic Monthly Press*. In this connection should also be mentioned Helen Marot's *The Creative Impulse in Industry*, and Thornstein Veblen's *The Instinct of Workmanship*.

were the philosophical discussions and the oratorical tirades concerning liberty, natural rights, and the right of revolution in the period following 1765 a defence reaction against the prevailing system of smuggling? It cannot be without some significance that the leading haranguer for liberty in Boston was fed and clothed by the leading smuggler, nor that the most conspicuous name on the Declaration of Independence was that of the most notorious violator of the customs regulations of Great Britain. Again, it would be interesting to know the psychological reasons why, as Sydney George Fisher has pointed out, the public statements of the leading colonial radicals indicate that their fundamental loyalty to Great Britain grew progressively more intense right down to July 1, 1776. It was long suspected and has recently been demonstrated that the legalistic arguments over nationalism and states-rights in the decade following 1789 were but the rhetorical drapery which covered the economic interests from the supporters of which Hamilton and Jefferson drew their following. Again, was not southern chivalry a collective compensation for sexual looseness, racial intermixture, and the maltreatment of the Negro? Further, as Professor Hankins has suggested, did not the abolitionist zeal of the New England deacons pleasantly obscure the fact that they and their fathers had gained their fortunes in rum trade with the Negroes of the West Indies? Then was Roscoe Conkling and his group more eager to conserve the "natural rights" of the Negro in the Fourteenth Amendment than to protect the corporation "nigger in the woodpile?" Were not the serious labor outbreaks of the "eighties" clearly an explosive revolt against the intolerable oppression of the labor element by the plutocracy during the great period of industrial expansion following the Civil War? And is the present frenzied adulation of the sanctity and fixity of the Constitution of the United States anything more than a concerted effort to protect and conserve the vested interests that have grown up under the protection of that document and its interpretation by a conservative Supreme Court?

In concluding this discussion of the relation of instinctive and unconscious mental activity to the psychological interpretation of history, it should be pointed out that these concepts greatly strengthen the notion of the continuity of history. It means that not only are the external or conscious aspects of culture handed down by education and other agencies, but also a vastly greater and more effective body of psychic motives and impulses are preserved in the realm of instincts and the unconscious.

## III. Summary

In this article the attempt was first made to trace the development of scientific historiography to the point where it has provided a vast storehouse of relatively accurate data for the historian; it was then shown that the work in this field of collecting sources and writing narrative political history was beginning to be supplemented by the next natural development of historical science, namely the interpretation of this vast amount of data in order to learn its significance in explaining the present order of things; next it was pointed out that, while there were a large number of interpretations of history offered, the psychological interpretation was gaining more rapidly in adherents than any other; Lamprecht's ingenious attempt at a schematic socio-psychological interpretation of history was then briefly described and its defects noted; Professor Robinson's views on this subject were then examined and the reasons were stated for believing that his prospectus marked a scientific advance over the system of Lamprecht through its wholly inductive procedure and its greater allowance for the individual psychic factors; finally, the more recent developments in psychology connected with the discovery of the importance of the instinctive and unconscious factors in psychic motives and impulses were mentioned and very briefly described, with a tentative survey of some possible applications of these new discoveries to the interpretation of historical material.

Whatever value one may assign to the psychological interpretation of history it must be admitted that it is yet but in its initial stages, and it would be rash to hope that it will gain in strength and volume with phenomenal rapidity in the near future. The great majority of "respectable" historians in most countries deny that history should concern itself at all with the problems of interpretation, or that it has any vital function in explaining the relation of the past to the present. Further, among the minority who believe that the interpretation of history marks the completion of scientific method in historiography, there is a division of opinion as to the most fundamental "interpretation." Finally, even those who accept the psychological interpretation of history are likely for some time to come to reject the more startling and original innovations such as the psychology of instincts, behaviorism, and above all, the new dynamic psychology of the unconscious. But no one need despair of a science which could advance from a

Gregory of Tours to a Waitz, an Aulard, a Gardiner or an Osgood, and from Aulard and Gardiner to Lamprecht, Seignobos, Maitland, Turner, Robinson, and Shotwell. We can even believe that a century hence a knowledge of that branch of psychology which Freud and his followers have elaborated will be regarded as a tool of the historian which is as indispensable to his success as Giry's manual on *Diplomatic* is to the present-day student of historical documents.

# THE NEURAL CORRELATES OF INSTINCTS AND HABITS

By Carl William Bock, Cornell University


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Introductory.—In a previous study[1] the writer essayed showing what kinds of group activities untrained subjects generally beat, and how they could be classified. In the present paper the writer wishes to present the same kinds of facts in relation to certain new kinds of facts and, further, to show how such facts may be employed analytically for the determination of the properties of the nervous system, and to what preliminary conclusions such analytical operations lead.

## A. Experimental

1. Definitions.—A distinction will be made between periodic activities and rhymical activities. By the former will be understood any series of regularly made activities amongst which either no differentiation occurs, as by accentuation or otherwise, or where such accentuation occurs vicariously. By the latter will be understood any series of regularly recurring activities amongst which a regularly recurring differentiation occurs, as by accentuation or otherwise, and irrespective whether such movements have conscious rhythmical accompaniments or not. Except where specifically stated to the contrary, the present paper is limited to a consideration of periodic activities in the sense of the above definition.

By a 'group' we shall understand any periodic activity which is a continuous function of a finite time interval or

[1] Bock, C. W., A Classification of Groups, *Psychobiology*, Vol. 1919.

duration, and such an activity can be most conveniently obtained from human subjects by requiring them to beat, i. e. tap, say, on the button of a tambour, *for any desired duration in any desired rate or tempo.* A 'group' has therefore the following properties: a number (G) which describes any particular activity or group with respect to the number of its contained beats or elements; a number (D) which describes a group with reference to the time interval or duration required for its consummation; a number (T) which describes a group with respect to the rate at which its elements, beats, are given; and a number, or an expression (K), which describes a group with respect to its structure or complexity. In the experimental portion of this study we shall be concerned with these variables, their manner of variation, and the correlations that obtain for such variations.

Our observers were instructed to *" beat as long as you desire in any desired rate, and then rest as long as you desire; so continue beating and resting until you are finally instructed to cease."* Thus made the activities in question were not conditioned by the specific environments of the subject but were solely conditioned by or within him. For their explanation we may hereafter therefore not appeal to environmental factors, save only the instructions, which however can strictly be said to condition only the series of groups and rests as such, but not a specific group or rest. In order to safeguard these conditions as much as possible, and maintain their status quo, certain precautions were taken or not taken depending on one's point of view. First, our observers were not permitted to count while beating. Second, lest the beating become a possibility of experience to the subject we required no introspections or self-observations. Third, lest such self-observations occur notwithstanding we encouraged, by non-prohibition chiefly, the performance of any other compatible activity simultaneously with beating, such as reading, studying, talking, singing, whistling, humming, smoking, 'thinking,' etc., with the result that both activities went on simultaneously and apparently dissociatively. We justify this procedure for the reason that we could not have prevented such extraneous activities had we so desired, except possibly under hypnosis, and also because we were not at all concerned with the specific condition of any given group or rest, so that if these extraneous activities did condition the specific nature of a group and rest, well and good. The extraneous activities are of course of the same nature as group activities and every argu-

ment as to their condition is equally applicable to both kinds. Finally, no reference was made to the word 'rhythm' or its connotation for reasons that will be stated hereafter. It should be said however that our subjects generally showed no tendency to beating rhythmically, except under certain conditions of which mention will be made.

The data on which the present study is based were derived from an aggregate of 11 subjects who beat a total of some 300 records, each consisting of from 20 to 50 groups and rests each. The material selected for presentation herein can therefore only be illustrative of the mass of records actually analyzed, but it should be understood that the facts which this selected material portrays are generally typical for all observers and all records. Tracings were made of all records in the usual manner. Time was counted in seconds, fifths, and 100ths, as specifically stated for each case, and approximated to halves, tenths, and two-hundredths.

2. Group Variables.—It is convenient to indicate by example the kinds of facts to which attention will be generally called herein. Subject S beat the following groups among an array numbering twenty-three:

| G. | D. | T. |
|---|---|---|
| 128 | 50.5″ | .394″ |
| 258 | 75.0″ | .282″ |
| 256 | 63.0″ | .249″ |

It is to be observed that the 128 group on the one hand and the 256 and 258 groups on the other are multiples; that the 256 and 258 are obviously variants of some common type group, the 256 undoubtedly; and that the following equations may be set up for them:

$$G\text{—}128 = G\text{—}128$$
$$G\text{—}258 = G\text{—}128 + G\text{—}128$$
$$G\text{—}258 = G\text{—}256$$
$$G\text{—}256 = G\text{—}128 + G\text{—}128$$

It is also to be observed that the corresponding durations (D) and therefore the tempi (T) (which are calculated from the formula $T = D/G$) vary, but *not* in the sense of the groups to which they correspond; and further, that the said durations and tempi are likewise multiples of a common number, 12.5 seconds; set down comparatively, the relations that obtain among the above groups, their durations, and their tempi are as follows:

| | | |
|---|---|---|
| G—128: G—256=1:2; | D—128: D—256=4:5; | T—128: T—256=8:5. |
| G—128: G—258=1:2; | D—128: D—258=2:3; | T—128: T—258=4:3. |
| G—256: G—258=1:1; | D—256: D—258=6:5; | T—256: T—258=5:6. |

This illustration serves for the formulation of the thesis of this study,—that group coefficients, (G), durations, and tempi are functional variables; that the primary form of such variability takes the form of ratios of small integers; and that the variability of each is not necessarily in the sense of the others.

A record, 11-9-18Ca, of Observer C is given in Table 1.

Ob. C. 11-9-18a TABLE 1

| G. | D. | R. | T. | T/Ta. | T/Tt. | E. | R. |
|---|---|---|---|---|---|---|---|
| 38 | 7.5 | 21.5 | .197 | 147.5 | 150.0 | 2.5 | 2/3 |
| 63 | 18.5 | 29.0 | .290 | 158.5 | 160.0 | 1.5 | 8/5 |
| 108 | 20.0 | 35.0 | .183 | 152.0 | 150.0 | 2.0 | 2/3 |
| 216 | 60.0 | 113.5 | .278 | 200.0 | 200.0 | 0.0 | 1/2 |
| 54 | 30.0 | 45.5 | .556 | 304.0 | 300.0 | 4.0 | 1/3 |
| 140 | 25.0 | 35.5 | .183 | 119.0 | 120.0 | 1.0 | 5/6 |
| 117 | 25.5 | 25.5 | .218 | 115.0 | 114.0 | 1.0 | 7/8 |
| 53 | 10.0 | 37.5 | .190 | 162.0 | 160.0 | 2.0 | 8/5 |
| 209 | 64.5 | 20.0 | .308 | 195.0 | 200.0 | 5.0 | 1/2 |
| 85 | 13.5 | .... | .159 | | | | |

We have herein an example exactly parallel to the preceding in the following complex of groups:

| G. | D. | T. |
|---|---|---|
| 108 | 20.0″ | .183″ |
| 216 | 60.0″ | .278″ |
| 54 | 30.0″ | .576″ |
| 53 | 10.0″ | .190″ |

Set down comparatively, the following relations exist among the group variables:

| | | |
|---|---|---|
| G— 53: G— 54=1:1; | D— 53: D— 54=1:3; | T— 53: T— 54=1:3. |
| G—108: G— 54=2:1; | D—108: D— 54=2:3; | T—108: T— 54=1:3. |
| G—216: G—108=2:1; | D—216: D—108=3:1; | T—216: T—108=3:2. |
| G—108: G— 53=2:1; | D—108: D— 53=2:1; | T—108: T— 53=1:1. |
| G—216: G— 53=4:1; | D—216: D— 53=6:1; | T—216: T— 53=3:2. |
| G—216: T— 54=4:1; | D—216: D— 54=2:1; | T—216: T— 54=1:2. |

We observe from the above that multiple groups occur; that the durations of such multiple groups are different and themselves multiple, but not in the sense of the multiplicity of the corresponding groups; that the same group (or variant) occurs in different durations; and finally, that the tempi of the groups are to each other as the ratios of small integers, octaves and fifths predominating.

Cursory examination of the record (Table 1) will show that the coefficients (G) of certain groups are apparently sum-

mations of other coefficients of the same record. In particular, the following instances thereof occur:

G—54 + G—85 = G—140 (140-1)
G—63 + G—54 = G—117
G—38 + G—38 + G—140 = G—216
G—38 + G—63 + G—108 = G—209
G—53 + G—85 = G—140 (140-2)
G—63 + G—53 = G—117 (117-1)
G—38 + G—63 + 2G—54 = G—209
G—38 + G—63 + 2G—53 = G—209 (209-2)
G—38 + G—85 + G—85 = G—209 (209-1)

Table 2 gives the temporal correlates of the above group summations, and is conceived on the basis of the following considerations. It was to be expected on a priori grounds that the duration of the summation group would be equal to the sum of the durations of the alleged components, but this is only rarely the case.

TABLE 2

| G | D | R | An. | d | D | R |
|---|---|---|---|---|---|---|
| 38 | 7.5 | 21.5 | .... | .... | .... | ... |
| 63 | 18.5 | 29.0 | .... | .... | .... | ... |
| 108 | 20.0 | 35.0 | 2-54 | 10.0 | 30.0 | 1/3 |
| | | | 2-53 | 10.0 | 10.0 | 1/1 |
| 216 | 60.0 | 113.5 | 2-108 | 30.0 | 20.0 | 3/2 |
| | | | 4-54 | 15.0 | 30.0 | 1/2 |
| | | | 4-53 | 15.0 | 10.0 | 3/2 |
| | | | 140 | 40.0 | 25.0 | 8/5 |
| | | | 2-38 | 10.0 | 7.5 | 4/3 |
| 54 | 30.0 | 45.5 | .... | .... | .... | ... |
| 140 | 25.0 | 35.5 | 54 | 15.0 | 30.0 | 1/2 |
| | | | 85 | 10.0 | 13.5 | 3/4 |
| | | | 53 | 15.0 | 10.0 | 3/2 |
| | | | 85 | 10.0 | 13.5 | 3/4 |
| 117 | 25.5 | 25.5 | 63 | 14.0 | 18.5 | 3/4 |
| | | | 54 | 11.5 | 30.0 | 3/8 |
| | | | 63 | 14.0 | 18.5 | 3/4 |
| | | | 53 | 11.5 | 10.0 | 8/7 |
| 53 | 10.0 | 37.5 | .... | .... | .... | ... |
| 209 | 64.5 | 20.5 | 38 | 11.5 | 7.5 | 3/2 |
| | | | 63 | 19.5 | 18.5 | ? |
| | | | 108 | 33.0 | 20.0 | 5/3 |
| | | | 38 | 11.5 | 7.5 | 3/2 |
| | | | 63 | 19.5 | 18.5 | ? |
| | | | 2-54 | 16.5 | 30.0 | 5/9 |
| | | | 38 | 11.5 | 7.5 | 3/2 |
| | | | 63 | 19.5 | 18.5 | ? |
| | | | 2-53 | 16.5 | 10.0 | 5/3 |
| | | | 38 | 11.5 | 7.5 | 3/2 |
| | | | 2-85 | 26.5 | 13.5 | 2/1 |

Accordingly it became our problem to determine what relationship existed between the duration of an alleged component as it occurred in the summation group and its duration as it occurred as such within the record. We therefore pro-rated the duration of the summation group among its components, and got derived durations which we compared with the durations which generally occurred in the record, and particularly with the durations of the components themselves. The plan of the table (Table 2) is in accord with the above; 'An' indicates the analyses of the corresponding groups of column 'G,' 'd' is the derived or pro-rated duration, 'D' the original duration, and 'R' the ratio of the derived to the original duration. It will be observed, first, that more frequently than not a given group has more than one set of alleged components, and second, that the derived duration is generally related as the ratios of small integers to the original duration. Sometimes also the same derived duration attaches to different groups.

Reference to Table 1 will show another class of facts. Considered successively and in pairs the tempi of groups are to each other or tend to be to each other as the ratios of small integers. In this table 'T/Ta' is the actual quotient of successive tempi; 'T/Tt' is the nearest simple theoretical ratio; 'E' is a measure of the error involved and is the difference between the actual and theoretical ratios, while 'R' is the fractional form thereof. A last class of facts is also indicated in Table 1. It will be observed that the same durations are recurrent, that multiple durations occur, that frequently the same duration attaches to a rest period as to groups, and that durations occur that are obviously summations of other durations.

Table 3 gives a record of the same observer and was made under slightly different conditions. Instead of resting on the completion of a group the observer was instructed to "*beat another group, or several such, in different tempi.*" He accordingly beat 'sets' of groups between which he rested (rests are not indicated in the table), but otherwise under the same conditions as previously. Time was measured in fifths of a second and approximated to tenths, etc., on a relatively fast moving drum. The plan of the table (Table 3) is as before and shows the same kinds of facts. Table 4 summarizes the principal ones. Particular mention should be made of the fact that whenever the 31 group occurs at the beginning of a 'set of groups' it numbers 31 beats; when it occurs in the

middle or at the end of such, it numbers one beat less, i. e., 30 beats. The reason therefor is obvious. In counting out these groups we included in the first one all beats up to the time when the tempo of beating changed, and so on throughout the whole set of groups. We questioned our observers on the propriety of this procedure, asking whether it appeared to them as if the beat before the tempo change occurred belonged to the preceding or to the succeeding group. We ourselves tried to determine the question phenomenologically, and

Ob.C. 7-3-18b. TABLE 3

| G. | D. | T. | T./Ta. | T./Tt. | E. | R. |
|---|---|---|---|---|---|---|
| 46 | 8.67 | .189 | 234 | 233 | 1.0 | 3:7 |
| 14 | 6.20 | .443 | 233 | 233 | 0.0 | 3:7 |
| 28 | 5.33 | .190 | | | | |
| 31 | 8.67 | .280 | 220 | 225 | 5.0 | 4:9 |
| 14 | 8.67 | .618 | 275 | 275 | 0.0 | 4:11 |
| 30 | 6.75 | .225 | 247 | 250 | 3.0 | 2:5 |
| 22 | 12.00 | .555 | | | | |
| 47 | 13.50 | .287 | 206 | 200 | 6.0 | 1:2 |
| 22 | 13.00 | .590 | 250 | 250 | 0.0 | 2:5 |
| 28 | 6.60 | .236 | 250 | 250 | 0.0 | 2:5 |
| 22 | 13.00 | .590 | | | | |
| 45 | 7.88 | .175 | 268 | 267 | 1.0 | 3:8 |
| 28 | 13.20 | .470 | 251 | 250 | 1.0 | 2:5 |
| 44 | 8.25 | .187 | 251 | 250 | 1.0 | 2:5 |
| 14 | 6.60 | .471 | | | | |
| 31 | 6.80 | .219 | 260 | 267 | 7.0 | 3:8 |
| 14 | 8.0 | .571 | 245 | 250 | 5.0 | 2:5 |
| 30 | 7.0 | .233 | 253 | 250 | 3.0 | 2:5 |
| 14 | 8.25 | .590 | | | | |
| 31 | 8.25 | .366 | 166 | 167 | 1.0 | 3:5 |
| 30 | 18.25 | .609 | 214 | 214 | 0.0 | 7:15 |
| 14 | 18.25 | 1.300 | 800 | 800 | 0.0 | 1:8 |
| 45 | 7.34 | .168 | | | | |
| 31 | 7.40 | .233 | 251 | 250 | 1.0 | 2:5 |
| 14 | 8.20 | .585 | | | | |
| 31 | 7.17 | .231 | 262 | 266 | 4.0 | 3:8 |
| 14 | 8.15 | .606 | 340 | 333 | 7.0 | 3:10 |
| 28 | 5.0 | .178 | 254 | 250 | 4.0 | 2:5 |
| 14 | 6.33 | .451 | | | | |

TABLE 3—Continued

| | | | | | | |
|---|---|---|---|---|---|---|
| 50 | 8.50 | .168 | 276 | 275 | 1.0 | 4:11 |
| 14 | 4.65 | .465 | 188 | 187 | 1.0 | 8:15 |
| 30 | 7.40 | .247 | 259 | 265 | 6.0 | 3:8 |
| 14 | 9.00 | .641 | | | | |
| 49 | 8.40 | .171 | 240 | 233 | 7.0 | 3:7 |
| 30 | 12.33 | .411 | 197 | 200 | 3.0 | 1:2 |
| 30 | 6.33 | .210 | | | | |
| 47 | 11.17 | .238 | 243 | 250 | 7.0 | 2:5 |
| 30 | 17.33 | .578 | 346 | 350 | 4.0 | 2:7 |
| 30 | 5.00 | .176 | | | | |
| 31 | 7.60 | .245 | 256 | 250 | 6.0 | 2:5 |
| 14 | 8.80 | .630 | | | | |

TABLE 4

| G.[1] | G.[2] | D.[1] | D.[2] | T./Ta. | R |
|---|---|---|---|---|---|
| 46 | 31 | 8.67 | 8.67 | 666 | 2/3 |
| 14 | 46 | 8.67 | 8.67 | 333 | 1:3 |
| 14 | 31 | 8.67 | 8.67 | 500 | 1:2 |
| 22 | 22 | 13.00 | 13.00 | 1000 | 1:1 |
| 14 | 31 | 8.25 | 8.25 | 500 | 1:2 |
| 14 | 44 | 8.25 | 8.25 | 333 | 1:3 |
| 31 | 44 | 8.25 | 8.25 | 667 | 2:3 |
| 14 | 14 | 8.20 | 8.25 | 1000 | 1:1 |
| 30 | 14 | 18.25 | 18.25 | 500 | 1:2 |
| 28 | 22 | 6.60 | 13.00 | 666 | 2:3 |
| 14 | 30 | 6.33 | 6.33 | 500 | 1:2 |
| 31 | 30 | 7.40 | 7.40 | 1000 | 1:1 |
| 28 | 14 | 6.60 | 6.60 | 500 | 1:2 |
| 28 | 30 | 5.00 | 5.00 | 1000 | 1:1 |
| 30 | 47 | 6.75 | 13.50 | 666 | 3:2 |

agreed with our observers that this last beat really belonged to both the preceding and to the succeeding groups. In other words, the final beat of the first group was also the first beat of the second group, etc. This assumption is borne out by the facts;[2] the intermediate groups which number 30 beats are factually groups of 31 beats precisely as the first 31 groups; the 14 group which occurs as an intermediate is factually a 15 group, i. e., the half of the variant multiple group 31. Particular attention should also be called to the predominance

[2] It also accounts for the final accent of isolated groups generally.

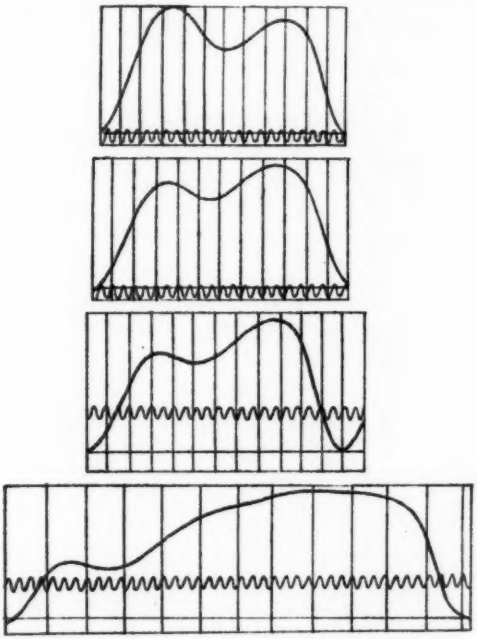
of the ratio 2:5 and possibly also the ratio 3:8. The observer casually remarked during the beating "that he had fallen into a rut, i. e., it appeared to him as if he were beating not only the same groups, but these in apparently the same general tempi." As a matter of fact he was beating quite a variety of tempi, but he was beating the same tempi successions predominantly. It should finally be noted that the duration 8.67 seconds occurs within a span of 5 groups three times, once for each of the groups 46, 31, and 15, i. e., for multiple or multiple variant groups. Other facts of the same kind are indicated in table 4.

The principal facts of a record of Observer S are indicated in table 5. The record is itself not included, but it as all records generally manifest the same tendencies heretofore shown. Of particular interest is the recurrence six times of the duration 46.5″ for three different groups and for two rest periods. The unusual predominance of the octave, fifth, and fourth relationship among the tempi of the indicated groups is also to be noted. When the 46.5″ duration occurs for different groups, these are related as the ratios of small integers; similarly for other identical durations. Multiple, identical, variant groups also occur. Summations occur but are not specifically indicated.

TABLE 5

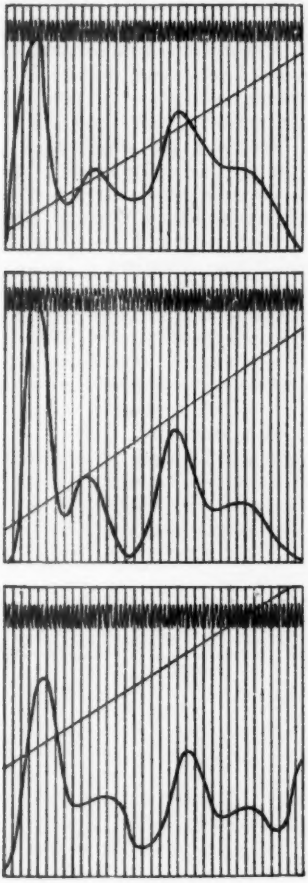
| $G.^1$ | $G.^2$ | $D.^1$ | $D.^2$ | $G.^1/G.^2$ | $D.^1/D.^2$ | $T.^1/T.^2$ |
|---|---|---|---|---|---|---|
| 64 | 192 | 37.5 | 37.0 | 1:3 | 1:1 | 3:1 |
| 107 | 214 | 18.5 | 37.0 | 1:2 | 1:2 | 1:1 |
| 110 | 165 | 33.0 | 33.0 | 2:3 | 1:1 | 3:2 |
| 180 | 181 | 40.5 | 40.5 | 1:1 | 1:1 | 1:1 |
| 149 | 112 | 46.5 | 46.5 | 4:3 | 1:1 | 3:4 |
| 217 | 164 | 46.5 | 46.5 | 4:3 | 1:1 | 3:4 |
| 217 | 149 | 46.5 | 46.5 | 3:2 | 1:1 | 2:3 |
| 180 | 181 | 40.5 | 67.0 | 1:1 | 3:5 | 5:3 |
| 134 | 132 | 43.0 | 64.0 | 1:1 | 2:3 | 3:2 |
| 111 | 111 | 22.0 | 42.5 | 1:1 | 1:2 | 2:1 |
| 288 | 143 | 52.0 | 68.0 | 2:1 | 3:4 | 8:3 |
| 112 | 112 | 21.0 | 46.5 | 1:1 | 4:9 | 9:4 |
| 110 | 111 | 33.0 | 22.0 | 1:1 | 3:2 | 2:3 |
| 164 | 165 | 33.0 | 46.5 | 1:1 | 5:7 | 7:5 |
| 90 | 180 | 45.0 | 40.5 | 1:2 | 9:8 | 4:9 |
| 90 | 181 | 45.0 | 67.0 | 1:2 | 2:3 | 4:3 |
| 112 | 217 | 46.5 | 46.5 | 1:2 | 1:1 | 2:1 |
| 78 | 110 | 66.0 | 33.0 | 5:7 | 2:1 | 5:14 |
| 149 | 417 | 46.5 | 46.5 | 2:3 | 1:1 | 3:2 |

3. Analysis.— We were led to the conclusion by inference from the facts of the preceding section as well as by the problems which considerations of 'amplitude' set, that a beat was a complex event which might be resolved into its constituent elements. We therefore so arranged our manner of taking records that our curves would lend themselves to



FIGS. 1-4

analysis, and applied the Fourier analysis to them in quite the same manner as these analyses are made of sound-wave tracings. It is important to remember that the application of the method to the analysis of curves of any kind in fact postulates the analysis it attempts. There is therefore no guarantee that actualities of function correspond to analysis, except for the confirmation that such analyses bring to other classes of facts from which the same inferences or conclusions obtain. It is



FIGS. 5-7

primarily for this reason that we find it convenient to anticipate the results of a study in preparation for the past year on the analyses of rhythm forms.

Our analyses are based on two methods chiefly. The first, that of Tait, quoted and employed by Fleming, Jenkin, and

Ewing [3] in their well known study of the analysis of phonograph tracings, lends itself readily for wave forms that are simple and short of duration, and permits the calculation of the first six partials. The second, that of Maartens [4], is applicable for more complex wave forms such as rhythms and for activities of longer periods, permitting the calculation of the first 18 partials. Erecting the number of ordinates to the curve as required by the particular mode of analysis employed, we measured the same in centimeters and fifths of a millimeter. This was accomplished through the mediation of a very finely etched steel rule and a high power reading glass to the back of which was stretched a rather fine black horse hair. In measuring, the glass was held so that the hair coincided with the intersection of the ordinate and the curve (really the glass was stationary, the curve being moved into the required position), and the reading on the rule was taken. The curves themselves were got by the method of Bingham slightly modified [5], i. e., the method of direct registration without the mediation of a tambour.

Herein no attempt will be made to deal with the question of phase differences. The results of the analyses will be simply indicated together with the tracing of the curve. For the simple beats the 'a' coefficients represent the sine terms and the 'b' coefficients the cosine terms. For the several rhythm forms the converse is true.

FIG. 1

| $a^1$ | $a^2$ | $a^3$ | $a^4$ | $a^5$ | $a^6$ |
|---|---|---|---|---|---|
| −0.55 | −0.62 | −0.09 | +0.05 | ..... | .. |
| +0.05 | −0.09 | −0.03 | +0.04 | +0.02 | .. |
| $b^1$ | $b^2$ | $b^3$ | $b^4$ | $b^5$ | $b^6$ |

FIG. 2

| $a^1$ | $a^2$ | $a^3$ | $a^4$ | $a^5$ | a |
|---|---|---|---|---|---|
| −0.58 | −0.52 | −0.11 | +0.16 | −0.03 | .. |
| −0.29 | −0.04 | −0.05 | ..... | −0.07 | .. |
| $b^1$ | $b^2$ | $b^3$ | $b^4$ | $b^5$ | $b^6$ |

FIG. 3

| $a^1$ | $a^2$ | $a^3$ | $a^4$ | $a^5$ | $a^6$ |
|---|---|---|---|---|---|
| −0.61 | −0.29 | −0.14 | +0.18 | +0.03 | .. |
| −0.30 | ..... | ..... | +0.03 | −0.04 | .. |
| $b^1$ | $b^2$ | $b^3$ | $b^4$ | $b^5$ | $b^6$ |

FIG. 4

| $a^1$ | $a^2$ | $a^3$ | $a^4$ | $a^5$ | $a^6$ |
|---|---|---|---|---|---|
| −0.43 | −0.21 | −0.21 | +0.01 | ..... | .. |
| −0.51 | ..... | −0.01 | −0.24 | ..... | .. |
| $b^1$ | $b^2$ | $b^3$ | $b^4$ | $b^5$ | $b^6$ |

[3] Trans. Royal Society Edin., vol. 28, p. 750.
[4] *Archiv fuer Math. u. Physik*, Reihe 3, Bd. 17, 1910.
[5] Psychological Review Monograph Suppl., No. 50, 1910.

FIG. 5

| $a^1$ | $a^2$ | $a^3$ | $a^4$ | $a^5$ | $a^6$ | $a^7$ | $a^8$ | $a^9$ | $a^{10}$ |
|---|---|---|---|---|---|---|---|---|---|
| +0.09 | +0.72 | +0.36 | +0.48 | +0.05 | −0.07 | −0.10 | −0.02 | −0.06 | −0.03 |
| +0.04 | +0.37 | +0.13 | −0.43 | −0.36 | −0.30 | −0.10 | −0.10 | −0.07 | −0.05 |
| $b^1$ | $b^2$ | $b^3$ | $b^4$ | $b^5$ | $b^6$ | $b^7$ | $b^8$ | $b^9$ | $b^{10}$ |

FIG. 6

| $a^1$ | $a^2$ | $a^3$ | $a^4$ | $a^5$ | $a^6$ | $a^7$ | $a^8$ | $a^9$ | $a^{10}$ |
|---|---|---|---|---|---|---|---|---|---|
| +0.19 | +0.80 | +0.15 | +0.62 | +0.05 | −0.06 | −0.18 | −0.13 | −0.13 | −0.09 |
| +0.11 | +0.05 | −0.24 | −0.23 | −0.46 | −0.35 | −0.14 | −0.08 | −0.03 | −0.02 |
| $b^{10}$ | $b^2$ | $b^3$ | $b^4$ | $b^5$ | $b^6$ | $b^7$ | $b^8$ | $b^9$ | $b^{10}$ |

FIG. 7

| $a^1$ | $a^2$ | $a^3$ | $a^4$ | $a^5$ | $a^6$ | $a^7$ | $a^8$ | $a^9$ | $a^{10}$ |
|---|---|---|---|---|---|---|---|---|---|
| +0.22 | +0.61 | +0.02 | +0.22 | −0.18 | −0.20 | −0.04 | −0.04 | −0.01 | ..... |
| +0.11 | −0.29 | −0.28 | −0.45 | −0.14 | −0.05 | −0.04 | −0.02 | −0.03 | −0.02 |
| $b^1$ | $b^2$ | $b^3$ | $b^4$ | $b^5$ | $b^6$ | $b^7$ | $b^8$ | $b^9$ | $b^{10}$ |

FIG. 8

| $a^1$ | $a^2$ | $a^3$ | $a^4$ | $a^5$ | $a^6$ | $a^7$ | $a^8$ | $a^9$ | $a^{10}$ |
|---|---|---|---|---|---|---|---|---|---|
| −0.03 | +0.07 | −0.05 | −0.02 | ..... | −0.10 | −0.03 | ..... | −0.02 | −0.02 |
| +0.15 | +0.12 | +0.34 | −1.05 | +0.06 | +0.50 | +0.16 | +0.04 | −0.03 | ..... |
| $b^1$ | $b^2$ | $b^3$ | $b^4$ | $b^5$ | $b^6$ | $b^7$ | $b^8$ | $b^9$ | $b^{10}$ |

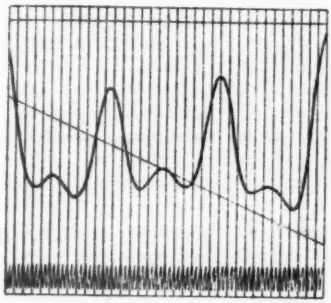


FIG. 8

The conclusion to be derived from the analyses of the above curves is obvious if actualities of function correspond to actualities of analyses. Beats are complex events, or may be conceived as such, and have components, primary components, whose coefficients (G) are to each other as the ratios of small integers, the durations or periods of the latter being also related as the ratios of small integers. With the more detailed facts of these analyses we shall not be presently concerned, and we may therefore postpone their discussion to a later paper of this series.[6]

[6] Attention should be called in passing to certain significant ratios which obtain among the amplitudes of the several components; cf. analyses, Figs. 3, 4, 5, 6, 7, 8. For example, in Fig. 3, $a_1 = 61$, $b_1 = 30$, i.e. 2:1; $a_1 = 61$, $a_2 = 29$, i.e. 2:1; $a_1 = 61$, $a_2 = 29$, $a_3 = 14 = 4$:2:1, etc.

## B. Theoretical

4. Introduction.—The point of departure of the present discussion is an expression,

$$G = D/T$$

which is on the one hand a descriptive generalization of group activities, and which expresses on the other hand the formal relationships which exist among their principal properties, number of contained beats (G), duration (D) and rate or tempo (T). The expression is nevertheless an abstraction, for it contains no factor for the group property 'structure' or 'complexity' (K), and no factor for the group and beat property 'amplitude.' We shall however find it convenient to consider the expression and its implications in the above more simple form, reserving a more complete formulation of the group equation for a later time in the discussion. Nothing which shall hereafter be said depends upon such present omission.

The expression $G = D/T$ is perfectly general, and may be regarded either explicitly or implicitly. Explicitly, it makes the group property 'G,' number of contained beats, the dependent variable, whose nature and numerical value in any particular case are conditioned by or are incidental to the natures and values of the properties 'D' and 'T,' the independent variables. Implicitly, any of the above three factors may be regarded as the dependent variable, and accordingly any two as the independent variables. The question arises which is the dependent and which are the independent variables.

This question assumes the validity of the conclusions arrived at in the experimental portion of this study, particularly those which declare the independent variability of the factors 'D' and 'T' with respect to 'G' and reciprocally; and from its form we may therefore state our first general deduction from the facts herein presented, namely, *that a full and adequate description of group activities involves at least two independent variables whose natures and values condition the nature and value of a third dependent variable;* from which it follows as a corollary, *that the neural structures involved for the production of group activities must be correspondingly complex and independently variable.* And this is the justification of the question previously put; for by the selection of our independent variables we define at the same time the properties

and variability of the neural complexes involved for the beating of groups.

The expression $G = D/T$ declares a physiological possibility that any given group is conditioned by two factors, one having duration and the other having rate. Since both 'D' and 'T' are independently variable, no other real alternative exists. The expression $D = GT$ declares a physiological possibility that the factor duration is derived and conditioned by two factors, one having rate, the other 'counting.' No other real alternative exists. Finally, the expression $T = D/T$ declares a physiological possibility that the rate of beating is derived and conditioned by two factors, one having duration, the other 'counting.' No other real alternative exists. In each of the above three cases an apparent alternative exists. For instance, we might in each case imagine the two independent properties attaching to a single, simple neural mechanism, there being as many such as there are possibilities of beating in different tempi and durations, each mechanism having both properties simultaneously. Our argument is not invalidated by this possibility, for we should yet have the same properties to deal with and to account for. Our problem in either case consists in choosing between a duration mechanism and a counting mechanism, either one in conjunction with a rate mechanism, or in conjunction with each other and to the exclusion of a rate mechanism.

Our appeal must be to physiology, particularly to neural physiology, where however we find no duration mechanism, no counting mechanism, and no real rate mechanism. Accordingly we shall be required to examine such concepts as we may find in the physiological stockroom, making application thereof for the explanation of group activities, and determining their limitations for explanatory purposes. The basic concept of neural anatomy and physiology is the meaning which currently attaches to the expression 'neurone theory,' which we shall regard as understood. The basic functional concept is the meaning which currently attaches to the expression 'reflex arc theory,' which meaning we shall assume as understood. Finally, the basic concepts for the explanation of activities other than simple reflexes are the meanings which attach to such expressions as 'concatenation of reflexes,' 'neurone chains,' etc., etc. Of subsidiary concepts there are the meanings which obtain for such expressions as 'resistance,' 'reciprocal innervation,' 'drainage,' 'deflection,' 'permeability,' 'synapse,' 'facilitation,' 'inhibition,' 'summation,' 'conduction rate,'

' fatigue,' etc., etc., all of which we shall assume as understood. Our present problem is the explanation of a certain group of assignable properties by the above concepts.

The group activity to be explained neurally is one of 22 beats (i. e., G = 22), duration 11.0 seconds (i. e., D = 11.0), tempo 0.500 seconds (i. e., T = 0.500), of simple structure (E = 1-22). The last named expression, that involving structure, we shall explain hereafter; it is sufficient presently to indicate that it has been assumed in such a manner (possible theoretically) that it will not enter into the discussion as a factor. We continue, apparently at least, to abstract from ' amplitude.' Assuming the first beat as environmentally conditioned, we have explained the first beat (antagonistic reflex). The second beat may not be environmentally explained, and neither may any of the other beats. There are two other possibilities for the explanation of the second and remaining beats of the group in question. They may be peripherally conditioned or centrally. On the basis of the first assumption we could imagine the downstroke of the second beat conditioned in the same manner as was the upstroke of the first beat conditioned, i. e., antagonistically (antagonistic reflex, concatenation, reciprocal innervation, etc., etc.), but the question would immediately arise; how is the variable rate of beat succession thereby explained, or in the case at issue, what conditions the period 0.500 seconds? The differential mechanism for a variable rate of beat succession might be imagined as having its locus in certain muscular sense organs; but even so, how is their differential functioning conditioned? also peripherally? The assumption of a central condition for a variable rate of beat succession has the same disadvantages. If centrally conditioned, the central condition may not be explained as itself environmentally conditioned, but assuming that the central condition were satisfactorily explained otherwise, what conditions the differential rate at which these central reflexes follow each other? Some mysterious synaptical transformation? But even if it were possible to explain the second and succeeding beats by such concepts as ' reciprocal innervation,' ' concatenation of reflexes,' ' after-discharge,' etc., there would still be the difficulty of understanding why the beating, once initiated, should not go on till exhaustion. Why does the beating stop so mysteriously at the conclusion of the 22nd beat? Of course, if certain group activities did not recur more frequently than would be indicated by a chance distribution, this mysterious stopping could receive the obvious explanation.

But the 22 group recurs time and time again, not only in one duration but in many different durations, and the idea of 'vicarious functioning' is inadequate. The traditional explanation applied in similar cases is the meaning which attaches to the expression 'reflex inhibition,' but a reflex inhibition requires an explanation as well as a reflex excitation. As a matter of fact we shall hereafter show that the rate of beating as well as the duration of beating are conditioned with and even before the first beat of a group is conditioned.

The logical fallacies which underlie present day neural and behavioral concepts are obvious. Activities are at least two-dimensional; the reflex arc doctrine is a uni-dimensional manifold whose elements are reflexes. With this unidimensional concept we can explain only unidimensional activities, simple reflexes, and not all of them. Two-dimensional activities require two-dimensional concepts, i. e., concepts which contain the proper and necessary differential possibilities. The subsidiary ideas of the reflex arc doctrine do not add such possibilities. In consequence thereof writers on behavioral subjects have generally contented themselves with making purely formal applications of the theory, or, where less formal attempts were made, have made up their theoretical deficiencies by borrowing the necessary variables from the environment by appealing thereto,—variables which ought to be in the explanatory mechanisms. We contend that the reflex theory is adequate for the explanation of simple reflexes properly so-called, but we can see no hope of its ever being adequate for the more complex forms of behavior,—for such forms as instincts, habits, 'willing' etc., etc., precisely for the reason that it is too simple and contradicts a formal requirement, that it contain as many variables as there are such in the activities to be explained. It is our present problem to attempt introducing the necessary variables into the reflex arc concept, and accordingly we recur to our previous statement, that this problem resolves itself into a choice between a counting mechanism and a duration mechanism, either in conjunction with a rate mechanism, or in conjunction with each other and to the exclusion of a rate mechanism. Of these possibilities we shall choose or postulate the existence of rate mechanisms and duration mechanisms for reasons as follow:

(1) The choice of a rate mechanism and a duration mechanism is the simplest possible assumption that can be made, for both duration and rate mechanisms are of the same

order, the former involving generally short durations, the latter long periods.

(2) A counting mechanism, i. e., mechanism which is simple and unitary, and which, once initiated, performs a certain number of times and then ceases, exists nowhere in nature or among artificial contrivances; on the other hand all artificial contrivances are combinations of rate and duration mechanisms.

(3) Rate mechanisms exist everywhere in nature, really exclusively to all others; further such mechanisms have already been postulated for the heart-beat and for respiration.

(4) A duration mechanism would be an additional requirement for activities that were not periodic of form. Counting mechanisms would therefore be superfluous.

(5) The postulation of duration mechanisms satisfies certain genetic requirements of which mention will hereafter be made.

(6) The facts of analysis point to rate mechanisms.

(7) Together and properly conceived, the postulation of duration and rate mechanisms suffices for a complete explanation of the facts herein presented, and for the facts of behavior generally.

Without bothering for the present to discuss the theoretical reasons which underlie the assumptions here made, or the consequences of these assumptions on current physiological ways of thinking, we shall make application thereof in a preliminary manner for the explanation of the same group activity for which the reflex arc theory was inadequate, namely, the group 22, of 11.0 seconds duration, and 0.500 seconds rate, still abstracting from the structure and amplitude factors. We assume first a neurone whose functional rate of discharge is 0.500 seconds; second, another neurone whose functional rate of discharge, i. e., whose duration of discharge is 11.0 seconds; third, a spatial orientation of these two neurones of such a nature that when the latter shall have been conditioned (and provisionally we shall assume an environmental condition) it shall discharge into the former, thereby conditioning 22 cyclic periodic discharges thereof. The analogy we would offer is that of the simple mechanism of a watch or clock.[8] Herein the mainspring represents the duration mechanism, the hairspring the rate mechanism, the gears the spatial nexus; depending upon the mainspring, the duration of ticking will be a day, a week, a month, or a year; depending upon the hairspring, the watch will tick seconds, halves, fifths, hundredths,

thousands, etc. The ticks made by the clock will therefore be a function of the particular hairspring and mainspring it possesses, and since both kinds of springs may vary in their respective ways, a watch or clock may be made which shall beat any desired number of times at any desired rate. Such variability we shall therefore assume for the neural analogies hereto.

Since the facts presented indicate that an organism can and does beat in a large number of different tempi, we must assume as many different neural mechanisms, i. e., rate mechanisms, as there are rates of beating simply; since the facts presented indicate that an organism can and does beat in many different durations, we must postulate as many duration mechanisms generally as it beats different durations; and finally, since the facts presented indicate that durations and tempi are generally independently variable, it follows that we must assume the spatial nexus as between these two classes of neurons correspondently complex. And hereby we shall have conceived our mechanisms for the more simple and elementary facts of group activities.

5. Group Structure.—There are certain classes of facts whose explanation is not quite so simple as the foregoing, which indicates that our conceived mechanisms are too simple. We have purposely conceived the simpler case first and may now proceed to a discussion of group structure and its implications.

The facts are these: a given group, say the 22, occurs regularly in different durations and different tempi; but more frequently than not, when this happens, both durations and tempi are related as the ratios of small integers. This phenomenon is of regular occurrence in activities other than groups. The same melody is generally perceived as such, i. e., it is the same melody, irrespective of the rate in which it is played or sung. The same melody learned on the piano, say, is generally speaking learned not only in the rate at which it was practised but also in any other desired rates. Now the important implication of this class of facts is this, that whatever was or is a condition for the 22 group in any given tempo was or is a condition for that group in any other tempo, but more particularly in *related* tempi and durations. To the consideration of this class of facts must be added that of another, namely; records show that the beating of a given group in a given duration and tempo is associated with the beating of its multiples in the same durations and tempi, or in other durations and tempi,

but most particularly in related durations and tempi. Now it would be quite simple to explain a group and its multiple whose durations were in the sense of their own multiplicity; it would be simple, for instance, to explain the 22 group of 11.0 seconds duration and the 44 group of 22 seconds duration. All that would be required is the assumption that the 22 group mechanism functioned twice in strict succession, and this is precisely what happens under certain conditions. At the same time it should be understood that this explanation, however simple and obvious, would not explain how it came about that the 22 group mechanism functioned twice in succession, i. e., this assumption would not be a complete explanation. The problem under consideration does not involve this simple case; it involves the case where the beating of a certain group in a given duration and rate is associated with beating the multiple of that group in the same duration or in related durations and rates; and the same implications as previously obtain, namely, that whatever was or is a condition for beating the 22 group in a given duration and rate was and is a condition for beating the multiple, 44, in the same or in related durations and rates. Finally, a third class of facts require consideration. Our records show that more frequently than not a given group may be summated from among the coefficients of other groups occurring in the same record, and frequently such summations are not limited to a single set of alleged components but often there are many such componential possibilities. Analysis of such cases shows further that frequently when the durations of a summation group are pro-rated among its alleged components, and when such prorated durations are compared with the original durations of the components, prorated durations often correspond to durations that occur therein for other groups, or for the alleged components themselves, or are related to these as the ratios of small integers. The case is simple where the sum of the durations of the components groups is equal to the duration of the summation group, and the explanation is obvious with the reservations as previously made for a similar case. In the case where the sum of the durations of the component groups is not equal to that of the summation group the inference lies close at hand that, while the components with the durations and tempi as in the record occurring may not be components of the summation group, they may be such in the tempi and prorated durations of the summation group. This inference is substantiated by the fact that the prorated durations are to the original durations as the ratios

of small integers. At any rate the same implications obtain as previously, namely, that whatever was or is a condition for the beating of different groups in different durations and tempi, is or was a condition for beating their sums in related durations and tempi.

Our whole discussion obviously hinges upon the meaning that is to be assigned to the expression 'whatever was or is, etc. . . . was or is a condition, etc.,' and to the facts of 'relatedness' as applied to durations, tempi, and group coefficients. This meaning becomes clear when we remember the possible inferences that attach to the facts shown by the mathematical analyses of beats and rhythm forms. If a beat were a simple event, motorly or neurally, obviously the subject would be performing a relatively simple activity in beating a 22 group, say, and possibly explicable on the assumptions heretofore made. But the beat is not a simple event. It is or may be conceived as a complex event, consisting of the algebraic summation of a number of *related pendular* activities; from which it follows as a corollary that an organism, while beating the 22 group, is simultaneously beating its multiples to the amplitudes indicated for each by analysis. Therefore the beater of a 22 group is also beating the 44, 66, 88, etc., in related tempi but in the *same* durations, and the 22 group in *related durations and tempi,* and therefore the condition for the 22 group in any given duration and tempo is also a condition for that same group in related durations and tempi, and for the multiples in related tempi and the same and related durations. What this condition is or was does not presently concern us; we are simply interested in the fact that the organism, when beating the 22 group, is simultaneously beating and simultaneously conditioning multiple groups in related durations and tempi and the same group in related durations and tempi.

The 22 group is complex in still a further way. Very young children do not beat 22 groups or groups as long as the 22. At birth they kick two or three or possibly four times, i. e., they beat the two group, the three group, and the four group, regularly with both upper and lower extremities. On adult observers even we have made similar observations. They regularly start beating rather short groups in the beginning. As their practice periods continue from day to day and from month to month they tend to beat longer and longer groups, and end finally by beating long groups exclusively, with the result that the final records of an observer can hardly be

analyzed without reference to the earlier records. We have cited[7] a rather pretty instance of this in the case of an observer who commenced beating the 22 group (our example is this same 22 group) predominantly; later he beat the first multiple thereof, the 46 group; still later, the third multiple, the 70 group; and finally he was beating the 94 group almost exclusively. To what limits he would have gone it is not difficult to foretell. He was already beating some of the higher multiples, though not predominantly. These facts are of course not new. Of very young children it is said, for instance, that they cannot attend, i. e., perform a certain activity, for any great length of time, but progress in this regard with time and experience. The same is of course true of the adult, except that the latter starts at a little higher level.

Now the important implication of these facts is this, that the 22 group, our stock example of activities in general, is itself but a stage of this developmental process; and just as the 46 group is composed of two 22 groups (we may provisionally think of it in this way), so the 22 group also has similar components. We shall hereafter show that the ancestral form of this component is the 12 group and not the 11 as might be supposed. For certain reasons certain variant forms of the 12 group become stable rather than the 12 group itself, just in the same manner as the 22 group does not develop into the 44 group but generally into the 46 or 47. But the same argument applies to the 12 group. It is also but a stage in the developmental process, and two six groups, or better three four groups, result for its components. Thus we may proceed retrogressively through the several rhythm forms to the ontogenetic limit, and finally end with the beat or simple reflex as the ultimate (with reservations made and yet to be made) activity element. Thus the 22 group, at the same time that it is structurally made up of its multiples, the 44, 66, 88, etc., groups has also the structure indicated by the complex:

$$K = \overline{22} = \overline{\overline{12} + \overline{12}} + \overline{\overline{\overline{6} + \overline{6}} + 4 + \overline{\overline{4} + \overline{4}} + 4}$$

$$\overline{\overline{\overline{3} + \overline{3}} + \overline{2+2+2}} \qquad \overline{\overline{2} + \overline{2}}$$

$$\overline{\overline{2} + \overline{1}} \qquad \overline{\overline{1} + \overline{1}}$$

This does not yet exhaust the simpler structural possibilities of groups. Analysis has shown that the beat may be resolved

[7] *Op. cit.*

into elements each of which can and does occur in variable amplitudes. It must therefore be assumed that the component (the beat) is complex, making for the beat or 'beatlet' property 'amplitude.'

6. Associations and Coordinations.—The general conditions under which associations are formed have been known for some two thousand years or more. They were perhaps first formally enunciated by Aristotle in his now famous laws of association, according to which environmental complexes that act on an organism contiguously in time or space condition therein the corresponding coordinations or associations. It is quite obvious that the Aristotelian formulae explain simultaneous association by the principle of contiguity in space, and successive association by the principle of contiguity in time. During the last few decades the associative law was rediscovered by Pawlow and his students, and enunciated in the physiological form. According to this form of the law, stimuli that act on an organism contiguously in time or space form coordinations therein such that later any one or any number of the contiguously operative elements of the environment finally become adequate for the elicitation of an activity which the whole or any other portion of the environment previously was adequate to elicit.

Our immediate concern is with the conditions which govern the formation of neural coordinations, and with their general nature, particularly in reference to the facts herein presented. For purposes of clearness our discussion must be separated into two parts, namely, one wherein we shall consider only those facts of group activities that are obviously habitual, i. e., which have been formed in postnatal life, and the other wherein we shall consider those facts of group activities that are obviously instinctive, i. e., those that are laid down in the heredity of the organism in question. Among the latter we shall include the coordinations that are implied by the amplitude variations of 'beatlets' as well as those that are implied by the components of a beat. Among the former we shall include the facts of development generally as these have been illustrated by the 22 group in the previous section. We shall consider habitual associations first.

It will be remembered that we have rejected the concatenation idea and its implications in favor of the assumption of a duration mechanism and a rate mechanism in conjunction with each other, and have explained the 22 group in that we assumed the 11.0 second duration mechanism discharging into a rate

mechanism of 0.5 seconds throughout its duration, conditioning thereby 22 cyclic, periodic discharges of the latter. The essential difference between these two conceptions is that the latter assumes a *common condition for a certain definite number of definite activities each of which is thereby conditioned in a definite order in the series which constitutes the whole activity or 'complex,'* the former conditioning each portion of the whole complex of activities by a preceding portion in the sense of the concept of 'reciprocal ennervation,' etc., etc. To the latter concept we shall give the name *'theory of integrands'* whose essence is that there are neural elements, *integrands*, which *integrate* or commonly condition the several activities which constitute a stable association, whether simultaneous or successive, whether homogeneous or heterogeneous, or whether instinctive or habitual, and which are developed from neurones of a younger phylogenetic order; the said development constituting what is commonly termed 'learning.'

For purposes of simplicity we shall proceed on the assumption that a beat is a simple instinctive activity, elicitable, as are reflexes in general, by some adequate environmental stimulus, or 'environmental beat.' In order that two organic beats or reflexes may be elicited, it is necessary that two environmental beats occur and effectively stimulate the organism in question. If now two environmental beats occur as such in a certain definite tempo sufficiently often, each time eliciting two organic beats, a time will presently come when *one* environmental beat suffices or becomes adequate for the elicitation of *two* organic beats. The interval of time between the stage when two environmental beats elicit two organic beats, and when one environmental beat elicits two organic beats, is commonly termed the 'learning' period, and is commonly explained by reference to the electrical concept of 'resistance,' it being said that 'the learning period is consumed in breaking down the resistance of higher paths so-called,' or 'in stamping in paths,' or 'in making synaptical connections of some kind,' etc. Our principal objection to the above kind of conceptions is that they are not biological, or better, that they are teleological. They contain no implications whatsoever which would lead one to believe that the statements made concern living, growing, or developing organisms, and certainly this is a formal requirement which must be basic to any rational conception of the mechanics of learning or developing. Neurones are unicellular animals, no less than amoebae, and the fundamental biological

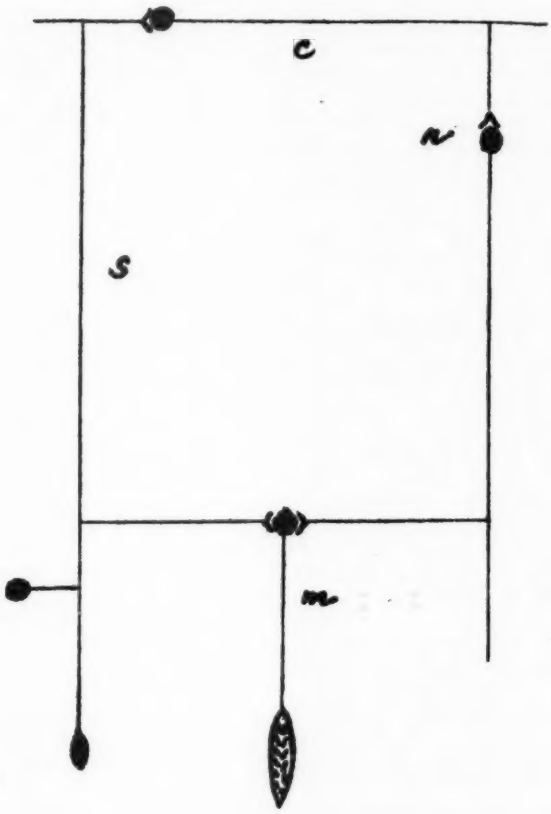



Fig. 9

concepts are as applicable thereto as they are to amoebae or to the unicellulars generally.

Figure 9 is a simple diagram of two superposed reflex arcs which are conceived as having the following properties: the lower arc is simple and is conceived at the level of the cord; the upper arc is also relatively simple, and is conceived partly

cerebral, and partly medullar. The cerebral portion of the upper arc we imagine as having an ultimate discharge period of 1.0 second; the medullar portion as having an instinctive discharge period of 0.5 second. At the time when two environmental beats condition two organic beats we imagine the discharge as taking place through the lower arc; at the time when one environmental beat suffices for the elicitation of two organic beats we imagine the discharge as taking place through both lower and upper arcs. In the interval required for the 'learning,' i. e., for the development of the 'integrand,' we assume a developmental process, conditioned by the discharge of the sensory neurone 's' summatively through the period of learning, as taking place in the cerebral neurone 'c,' of the order of an acceleration of its life activities, or of its metabolism, and a consequent increase of its functional capacity, such that when its phylogenetic limit of development shall have been reached, it will, once stimulated (by 's'), discharge once through an interval or duration of 1.0 second, the said discharge taking place onto or into the rate mechanism 'r' with which it is spatially associated, conditioning therein two periodic cyclic discharges, or ultimately two organic beats, these in the tempo 0.5 second and duration 1.0 second. This is the simple picture of the neural mechanism involved for the beating of simple groups as we conceive it and as we shall hereafter formally develop it in relation to the facts herein presented, as well as in relation to certain other fundamental forms of association, both instinctive and habitual.

Thus conceived, a two-group activity differs from an activity of two beats in several ways. In the first place the two activities are differently conditioned, i. e., they presume different environments. The two group is conditioned by an environment of one beat *provided however that the statistically most frequent environment continues to remain one of two environmental beats, for, unless this remains true, and provided also that the integrand for the two group is itself not conditioned by heredity, it (the integrand) will readapt for the statistically more frequent environment of one beat, and will thereafter not be able to integrate two organic beats.* Structurally the activity in question may be described by the expression,

$$\frac{1}{1 + 1}$$

indicating the unitary character of the group, i. e., recognizing the integrand, and the duality of the activity, i. e., recognizing

the rate mechanism. The expression simultaneously describes the environment by which the group is conditioned, and on account of which it was formed.

There is another way in which the two-group differs from an activity of two beats. The first beat of the two group is obviously conditioned twice, first in the lower arc, then in the upper arc. The second beat is however conditioned but once, and that in the upper arc. In consequence thereof, the amplitudes of the two elements will differ, the amplitude of the first being the greater, and the picture presented will be that of the typical two-rhythm with an accented first beat, i. e., the resultant of beating a one group and a two group simultaneously.

While the formation of the integrand for the two group is proceeding as indicated above, the development of the higher integrands is progressing simultaneously, and to degrees which are proportional to their phylogenetic remoteness from more primitive forms, particularly however, if the environment of one beat or of two beats becomes still more frequent. Through the agencies of the lower integrands these higher integrands will be formed in succession, or developed to the limit of their several phylogenetic capacities, and at intervals during which no apparent developmental progress is being made (plateaus); presently therefore the organism in question will react to one environmental beat by three organic beats, still later by four organic beats, still later by eight organic beats, and finally he will arrive at the stage of the observer who, in the beginning of beating, beat the 22 group predominantly. Thus this process of learning develops progressively with time with the formation of higher and higher integrands, alternating periods of progress (growth) with periods of no apparent progress (plateaus, periods of rest, etc.), until the organism shall have become adapted to the environment in which he casually finds himself, and completing his ontogeny (specific for different organisms) in postnatal life.

It must be remembered that beats are to be conceived as complex events, consisting of an integration of a fundamental plus certain related, i. e., lower partials. It must follow therefore, as a matter of course, than when one beat, say, is being integrated into a two-group, the constituents of a beat (themselves two groups, three groups, four groups, etc.) are conditioning the formation of their own specific integrands. Such integrands will therefore be for certain four, six, eight, etc., beats *in related tempi but in the duration of the original two group integrated simultaneously;* i. e., in the formation of the

two group integrand, the organism will have conditioned integrands for related groups in related tempi but in the duration of that group. And this process proceeds for the higher integrands, i. e., for the formation of the three, four, five group integrands, whose formation will simultaneously condition integrands for the 6, 9, 12, and 15 groups and for the 8, 12, 16, 20 groups, all in the duration of the three and four groups respectively. But the durations of the basic two, three, four, etc., groups are different though related; and as indicated above, the three and four groups will condition each a 12 group integrand among others, but each of these 12 groups will of need have different but related durations. It will become clear, as one imagines this process continuing during the life of the organism, how complex and interrelated the different activities will eventually become, particularly when it is remembered that the integrands for two or more different groups may condition the development of their own specific common condition; i. e., an integrand for a group which can be expressed as the sum of two or more different groups in the record occurring. We have made this observation: that our subjects did not generally beat in related tempi and durations in the beginning, but tended to do so more and more with continued and progressive beating. If this be true, and we incline to the view, one might be tempted to speak in terms of habit formation, but it is to be remarked that the term is applicable only where a specific environmental factor for the habit in question is known to have been operative during the practice period. Such factors we can by no means admit. There is therefore no other way of interpreting the facts of 'relatedness' except on the assumption that beating in related tempi, etc., is instinctive or conditioned prenatally, or at least very early in life.

In the domain of audition where similar facts of relatedness play such a predominant rôle, the same assumptions must, we contend, be made. The average, non-musical lay observer regularly perceives a given tone and its octave synthetically, as Helmholtz puts it, and similarly with the fifth, etc., though progressively less frequently as the order of the partial increases; i. e., relatedness is primary, just as in beating. This means of course that the average lay observer cannot distinguish between an environment which consists of a tone and its octave and one which consists simply of the tone, and this in turn means that he reacts to both environments similarly. An increase in the frequency with which the environment of

one tone occurs now regularly conditions an analytical reaction; that is to say, if the given tone is played alone a number of times, and its octave is also played alone a number of times, the resulting reaction to both simultaneously given is as to each separately but algebraically. In ordinary parlance then, the observer analyzes the clang, but it is to be emphasized that in this case he is simply beating two beats but not a two group, to carry our previous analogy of the two-group over. In psychological terms, in the one case the observer is perceiving a clang, in the other he has simultaneously sensations of the two tones in question. Neurologically therefore it should be quite the same whether one actually beats in related tempi simultaneously or whether one hears related tempi (related tones) simultaneously. We therefore assume the same kind of coordinations for auditory experiences as we have assumed for activities, with the same implications regarding the manner and the conditions under which they have been formed.

The coordinations explained and discussed above assume that there are *elements* to be coordinated and integrated, and the final question arises as to the assumptions which we must make in regard to the elementary neural events by means of which our elementary auditory and beating experiences are conditioned or were conditioned. Our limits of beating extend from about one in two seconds to about ten or twelve in one second. Significantly enough, our lower limits of hearing about coincide with the upper limits of beating, and extend from this point up to about 25,000 per second. We have previously assumed 'rate mechanisms,' and we now complete our assumption with the addendum that the rate mechanisms thus assumed, whether for beating or for hearing, were originally conditioned by both primitive as well as present auditory environments through primitive as well as present sensory mechanisms, the latter being today constituted by the hair-cells of Corti, the only sensory homologues in the cochlea; such sense organs as well as rate mechanisms having periodicities of the same order as the conditioning environments.

# A NOTE ON THE PSYCHOLOGY OF VITALISM

By Frederick G. Henke,
Allegheny College, Meadville, Pa.

No less important than the rational and empirical investigation of the metaphysical validity of mechanism on the one hand and vitalism on the other, but quite as fundamental, is a satisfactory answer to the question as to why men believe in mechanism and vitalism. Nor is the answer simple, since human nature is so complex that the wisest of men understand it only in part.

That it is essentially a question of human nature is shown by the fact that the issue reaches an acute form in the empirical study of the mind-body relation, and by the tenacity with which the human race as a whole has clung to a vitalistic interpretation of perplexing problems of its physical and social environment. Though the nature of the nerve impulses continues to be the subject of discussion among scientists, it is not so difficult to agree that the transition from external physical stimuli to physiological nerve impulses may be described in mechanistic terms. But the transmutation of physical and physiological stimuli into sense perception — atmospheric vibrations into a largo or a symphony, for instance, or vibrations of the ether into a Mona Lisa or an Ecce Homo — is quite another issue; for the data of immediate experience seem to indicate the presence of something more than causal relation as viewed and interpreted by the onlooker, even though he be a trained scientific observer.

The deep-seated tendency of a man to espouse vitalism is evidenced not only in its historic continuity but in its present-day manifestations — in the attitude of the men at the front during the past months, for example, and of their relatives and close friends at home. Whatever a man may be in the grill-room or at golf, he is quite different in the presence of an impending crisis. In seasons of great danger, difficulty and distress, he puts his trust in vitalism, not infrequently of an extremely naïve type. Though the innermost motives and purposes of men are not readily exhibited, it is entirely probable that at unguarded moments all men are vitalists. The

disquisitions of scientist and philosopher, and the disputations of scholars carry a large measure of conviction with them as to the adequacy of the mechanistic point of view; and after the individual has left the laboratory and turned his back on the philosopher's closet, he acts like a vitalist in the office, home, church, and club.

Were man merely intellect, and his interests always only logical, his belief would naturally be mechanistic. The intellect has an insatiable appetite for logical categories, rigorously applied causal relations, and a fabric of knowledge closely woven without any loose ends. The facts of observation, especially of scientific procedure, are classified and organized into systematic wholes, and any loose ends are carefully tucked away with the hope of disposing of them later. Their presence, while a bit disconcerting, does not give rise to any lack of confidence in the ultimate solvability in terms of cause and effect relationships of the most intricate and involved problems.[1]

To get at the heart of the issue, it is important to uncover and exhibit the foundations of belief and human action, for a clear understanding of motives is the *sine qua non* of an adequate apprehension not only of human purpose and endeavor, but of the growing institutions of society. The very fact that certain institutions have survived from the dawn of the historic period to the present and in all probability existed in the pre-historic ages, and that they today claim a large portion of the time and energy of groups from savagery up to the most enlightened peoples, lends plausibility to the belief that they are functionally established as fundamental to human life, and that the underlying involved concepts, explicit or implicit, possess a validity which should not be countermanded until the institutions themselves show signs of decay. That vitalism is one of these notions need hardly be stated.

On the other hand, the historic development of attitudes whose realization and unfolding have greatly facilitated man's control of his physical and social environment suggests the presence of something essential to the analysis of the world order. Successful methods of control may well point to the validity of the notions out of which they arise. No one will seriously question the dominating position of the mechanistic point of view in invention and the formulation of the laws of

[1] Vide Henry Fairfield Osborn: *The Origin and Evolution of Life.* (New York, 1917.)

nature. Since marvellous effects have been wrought and are still being produced before our eyes in laboratory and workshop, the principles underlying the various techniques are invested with unusual prestige. Their successful application to ever-widening fields of thought and endeavor quite naturally gives rise to the conclusion that the mechanistic point of view will drive vitalistic conceptions before it until it reigns supreme. Quite in harmony with this, the standpoint of modern mechanism may be summed up as follows: All the phenomena of the world of human experience, not only those of physics and chemistry, but those of biology, psychology, religion, the moral life, and the social and economic relations of life, lend themselves to a mechanistic interpretation. The only hindrance in the way of actually doing so is man's ignorance and inefficiency in the presence of extremely complex situations.

The antithesis between the two points of view thus stated is sharply drawn, resolving itself in the minds of many into Kant's third conflict of the transcendental ideas; for however empirical mechanism is at the beginning, it becomes speculative as soon as it rises above the solid foundation of observed facts. And yet it is not necessary to state the relation between the two in this way.

By its very nature mechanism is the standpoint of the observer viewed as observer, while vitalism represents in last analysis the attitude of the agent. *A* is seated comfortably in his home reading the evening paper; the doorbell rings and he goes to the door to see who has come. The observer *B* says he performs the act because the doorbell rang, and if he is in a scientific frame of mind he attributes it to the activity aroused by the stimulus in specific segments of the nervous system, interpreting the act as a whole in terms of physico-chemical reaction. *A* himself in offering an explanation quite naturally takes the agent's point of view, saying that the act was voluntary on his part, and that in this instance, as on previous occasions, he could have disregarded the stimulus.

The case cited lends itself readily to the interpretation of the observer on the one hand and of the agent on the other, for both observer and agent are involved; but one and the same person may quite readily take the position of both. This is especially true of men who have undergone some scientific training—who in moments of investigation usually take the calculating point of view of the observer, but who are nevertheless prone to assume the agent's position when confronting

very perplexing situations. The more thoroughly the mind becomes imbued with the principles of science and methods of scientific investigation are reduced to habitual reactions, the more likely the individual will be to eliminate anthropomorphic conceptions from vitalism. Introduced in the first place almost spontaneously, advanced to the position of teleogical explanation, vitalism becomes more refined and attenuated until there is nothing left but teleology.

The modern concept of evolution may serve to illustrate this last phase of vitalism. Within the order of nature, cause and effect are unquestionably operative, for specific applications of general laws may readily be exhibited; but the whole is vastly more than a mere juxtaposition of parts. Temporal sequence of processes so that one complements the other, coöperation of general laws so that systematization takes place, profound mutations most auspiciously arranged to facilitate adaptation are included in the whole. That they mystify the scientific investigator need not be said. He may put them aside for future reference, believing that they may finally be taken up in a mechanistic explanation of the whole order as such; or perplexed beyond description he may take the point of view of the agent, ejecting perhaps unwittingly his own experience of purposeful action into the process and asserting the presence of teleology—not crude anthropomorphic planning but vitalism as attenuated as the entelechy of Driesch or the *élan vital* of Bergson.

A statement of this attitude is found in the article, "A Biologist's Religion," published in a recent number of the Monist. The author, after specifying various failures of mechanism in attempted explanation of biological issues, goes on to say: "The crux of the whole matter is here: whether we feel safer in trusting to the pronouncements of biased observers, or in being guided by finer intuitions. Since the intellect is only equipped to grapple with the things of the intellect, we cannot rightly expect it to do justice to itself in matters entirely outside its domain. Those of simple faith, unhampered by intellectual trappings, unaffected by dictation of historically authorized formulas, are best fitted to appreciate a process having nothing in common with a restricted human intellect."[2]

This pronouncement of a modern biologist may be compared

[2] Walter Sonneberg: A Biologist's Religion, *Monist*, XXVIII, pp. 567-585.

with the experience of an oriental statesman and scholar, Wang Yang-ming, who in his search for truth undertook to investigate the bamboo. He first encouraged a friend to make the attempt; but as the latter fell ill after three days of intense application, he turned to the task himself. "I myself undertook to carry on the investigation," he said. "Day and night I worked, unable to understand the principles of the bamboo, until after seven days I also became ill because of having wearied and burdened my thoughts." His enlightenment came while he was living, an exile, among savage tribes. "My nature is sufficient," he said at that time, "I was wrong in looking for principles in things. To understand things one must investigate and understand the mind. Intuition is the door and the way to all real knowledge."[8] Needless to say, the Chinese philosopher, like the modern intuitionist, was a thorough-going vitalist.

The oriental scholar may appear more primitive in his method of reaching the conclusion, but the technique is essentially the same wherever the individual espouses vitalism under whatever name it may be: he ejects it from his own nature into the order of nature. Subsequently, there is ample opportunity for the intellect to make its influence felt by working the belief over according to the forms of the understanding; but not to the extent that the camouflage is imperceptible to the initiated. The penetrating effect of the intellectual life into vitalistic beliefs varies in different persons, and in the same person at different times. In any case vitalism is associated preëminently with crises and for this reason the mature mind and old age are not exempt.

But the psychology of vitalism calls for a more thorough-going and incisive analysis of the situation. Held by all classes and conditions of men in all times and places, this interpretation, the psychologist suspects, has its roots deep down in the foundations of belief and actions, seeming to spring up out of human nature as vegetation grows from the earth. The question, thus viewed, is essentially one of motives, for the beliefs, actions, and institutions of human life take their origin from this matrix and have their being in this realm. Thus, if other motives are substituted for those now effective, beliefs, actions, and institutions will be profoundly altered; and if it should transpire that by a *coup de maître* science succeeded in

[8] *The Philosophy of Wang Yang-ming* (Chicago, 1916), pp. 177f.; also p. 13.

eliminating all but reflection as a controlling motive of man, human life would be transformed into something very different from what it now is. Old institutions would all go, and we would before long have a new world

It is among the congenital characteristics of human nature that the social psychologist seeks for the explanation of the tenacity with which man holds to vitalism; and among these none are of greater importance than the instincts and their corresponding emotions. These tendencies to act represent, structurally, imbedded pathways in the nervous system, and functionally, inherited effective adaptations. That they severally and conjointly have profound social implications is what would be expected, for in the environment of the various species of higher animals social aspects are outstanding. They had to adapt themselves not only to animals of the same species, but to those of other species with which they came into contact. In the instance of the *genus homo* conditions were in this regard not materially different: only those survived who adjusted themselves to the social environment.

An examination of the instincts as we find them today fully justifies any expectation regarding their social character. They have social implications; some more than others, but all of them in a substantial measure. McDougall's list, if the food instinct is added, is as satisfactory as any: food, sex, fear, repulsion, pugnacity, curiosity, self-abasement, self-assertion, parental instinct, gregariousness, instinct of acquisition and instinct of construction.[4] Considered from the neurological point of view, each consists of affective, central, and effective processes. The affective processes of the instincts by the very nature of the environment have throughout the history of the human race been largely aroused to activity by other human beings and by animals; and the effective or motor processes have been directed toward mediating certain social effects. The central processes include the emotional and ideational aspects of the instincts. Least subject to change of the processes, they constitute the foundation upon which man has constructed his notions of the order of nature.

As long as the inherited tendencies mediate control smoothly and efficiently, the attention remains spontaneous; but when they fail to function thus, it rises to the highest level. The interest at the beginning, phylogenetically and ontogenetically considered, is immediate; and in this condition attitudes are

[4] William McDougall: *Social Psychology*, Ch. II.

not accompanied by ideas. It is quite obvious, however, that these earlier manifestations of attitudes are vitalistic in implication rather than mechanistic. But frustrated instinct is the matrix in which ideas arise, and unusual experiences are the first ones that attract attention. Consciousness of self and consciousness of others are born together; the inanimate, lifeless thing, dominated by causal relationships, is a much later product.

Historically, the process whereby physical objects were distinguished from those that are social must have been long and laborious, for the Ionian physicists of the sixth century B.C. were hylozoists, thus showing that they did not recognize the difference, and even the atomist, Leucippus, clung to this belief. Early endeavors of human thought dealt with the unusual as opposed to the usual; no term for nature, much less for the "order of nature," is found among primitive peoples. The application of thought to the solution of unusual experiences first gave rise to vitalism; later rational and empirical investigation of the normal and usual experiences led to the acceptance of the mechanistic standpoint.

The conception of "mana" widely held in the Pacific region, "oudah" of the Pygmies, and "orenda" and "wakanda" of the American Indians, are convincing examples of incipient vitalistic tendencies of primitive man. These conceptions, while definitely held, are not fully formed concepts. They have in them more of the "projective" stage of the dialetic of personal development than of the "subjective" or ejective stages, constituting "a piece of subconscious philosophy," according to Marett.[5] The connotation and denotation of "mana"—and similar terms from other regions—though somewhat indeterminate cover "all manifestations of mysterious, or supernatural, power in magic and religion alike."[6] Insofar as control is supposed to be present, as in the black art, there may seem to be a bit of a suggestion of the appreciation of cause and effect; but analysis shows that when appeal is made to magic primitive man is dealing with unusual situations, and that the power invoked is much more closely akin to Tylor's animism than to the abstract causal relation of mechanism.

[5] James Mark Baldwin: *Social and Ethical Interpretation* (New York, 1906), pp. 13f.; *Mental Development* (New York, 1915), pp. 319f.; also R. R. Marett: *The Threshold of Religion* (New York, 1914), p. 103.

[6] *Ibid.*, p. 99.

When "mana" crystallizes into a definite concept, it takes the form of animatism — life is ejected by the mind into the objects of nature, and they are regarded as living. Nothing is exempt from high heaven and the sacred mountain to the rock which is said to hold parental relation to the surrounding small stones. The only thing required is that the attention be drawn to them with sufficient force to elicit an explanation. Tylor's animism, involving the movement of separate spirits from one habitat to another, is but a further elaboration of the same tendency under the influence of striking psychical experiences.

Man is a social being at heart, not only through the inheritance of social tendencies, but as a result of the dominantly social factors in the development of his personality — suggestion, public opinion, and custom, for instance. Once begun, the impact of these agencies is well-nigh irresistible. Vitalism represents the adamantine impression which these combined factors make upon his interpretation of his environment. Present everywhere in primitive life, the "call of the wild" carries over into all historic periods and all stages of culture above savagery. That it bears the marks of the emotions and the sentiments and thus is a phase of romanticism is quite obvious; but this fact only goes to show that there is a presumption in favor of its continuance in the future.

So long as the human being remains a human being, the little girl will continue to view her dolls not as so much cloth, sawdust, china, and hair skillfully combined to look like a human being, but as alive and as needing her attention and tender care; the man who barks his shin on a piece of furniture at night will consider the offending rocker, not as so much wood and glue, dead and lifeless, but as something living upon which to vent his anger; and the carpenter who strikes his thumb a hard blow will bless the hammer quite out of proportion to what he would if it were for him at the moment only a bit of steel with a handle attached. They are vitalists at heart, and when off guard certain stimuli arouse responses clearly indicative of it. When the trained observer finds organization, temporal sequence of development, configuration, adaptation, and unlimited power in the universe, and at the same time realizes how ineffectually the intellect has been able to comprehend them, and how limited has been man's control of natural forces, it is not surprising that admiration and awe should be stimulated — and not infrequently reverence. But these are *par excellence* sentiments with vitalistic

implication. What wonder, then, that many scientists are by confession vitalists?

The question of vitalism and mechanism from the point of view of psychology does not resolve itself into an antithesis; not "either, or," but "both, and" expresses the relation between the two. Man is both vitalist and mechanist. The instinctive, emotional part of his nature, abundantly supported by age-hallowed custom and the organization he finds in nature, influences him to hold a vitalistic, teleological point of view; the intellect with its concepts and categories, adjusted to serve as an instrument of adaptation to novel features of his environment, and to order and interpret the facts of sense perception, makes him espouse mechanism. In some the instincts and emotions are overpowering in their influence at all times; others have through long training in scientific research given the intellect a dominant place; still others maintain a sort of equilibrium between the two. The proportion of vitalism and mechanism present in the beliefs of any individual may be interpreted in the light of these facts.

## MINOR STUDIES FROM THE PSYCHOLOGICAL LABORATORY OF CORNELL UNIVERSITY

Communicated by E. B. TITCHENER and H. P. WELD

### XLIV. ON THE LAPSE OF VERBAL MEANING WITH REPETITION

By M. F. BASSETT and C. J. WARNE

It is well known that if a familiar word be stared at for a time, or repeated aloud over and over again, the meaning drops away.[1] In this paper we report the results of experiments whose aim was the determination of the number of repetitions required for monosyllabic nouns to lose their meaning.

The stimuli consisted of common nouns taken from the vocabulary of every-day life, such as *cat, box, heart, storm, fire.* These were presented auditorily, one at a time, to each of two observers: the one served first as *E* and then as *O*, while the other served first as *O* and then as *E*. A normal series consisted of 50 words, and in the total experiment there were 7 of these: a preliminary experiment, which consisted of two series at different rates of repetition, and the experiment proper, which consisted of five series at a single rate. The final series, however, was a test-series, given after an interval of two weeks to see if the observers' attitude had become stable. The rate of repetition was controlled by a soundless metronome giving seconds; and both the number of repetitions and the rate employed were, in a fashion, checked by taking the total time of an experiment by a stop-watch.

*Preliminary Experiment.* The rates of repetition employed in the two preliminary series were 2 and 3 words per sec. respectively. The rate having been announced, and the observer practised in that tempo by watching the swinging pendulum, the following instruction was given: "I am going to give you a common word and you are to repeat it aloud until it has lost its meaning. At the close of the experiment you will give a general account of the experience." The quantitative results of these preliminary series we give in Table I.

TABLE I

| | | PRELIMINARY SERIES | | | |
|---|---|---|---|---|---|
| Rate per Sec. | Obs. | No. Cases | Av. No. Repetitions | Median | Av. Total Time |
| 2 | B | 50 | 42.3±6.2 | 39 | 22.3±12.0 |
| | W | 50 | 54.0±12.6 | 49 | 18.2± 7.1 |
| 3 | B | 50 | 30.2±5.75 | 30 | 9.7±2.3 |
| | W | 50 | 46.2±9.6 | 45 | 15.5±3.5 |

[1] E. B. Titchener, *Beginner's Psychology,* 1915, 26. See also A. Binet, *L'étude expérimentale de l'intelligence,* 1903, 73f.; A. Messer Experimentell-psychologische Untersuchungen über das Denken, *Arch. f. d. ges. Psychol.,* vii 1906, 73ff.

An inspection of the table shows that meanings drop away more readily with the faster rate of repetition. There is also with this rate a lesser variation in the number of repetitions, although the range of variation is with both rates excessive. Finally, the averages themselves are surprisingly large. This fact, taken together with the wide range of variation, may indicate either that the stimuli were not uniform, or that the attitude of the observer was extremely instable, or perhaps that both sources of error were at work. The reports of experience show, however, that the second factor was in truth the principal condition of the result. The observers, instead of taking the word with its habitual meaning upon it, undertook to 'make' it mean, to 'think about' its meaning. The consequence was an active, searching attitude, which in turn resulted in visual imagery of objects, or in a succession of verbal ideas, or in a fluctuation of the primary with other meanings.

*The Experiment Proper.* Since the experiment by its very nature demanded a passive attitude, one that would (as it were) let the stimulus have its way with the observer, we changed the instruction in the experiment proper to read: "Take the stimulus naïvely as a word, and do not 'think about' its meaning; repeat the word aloud until it has lost its meaning." We also, in these experiments, limited ourselves to a single rate of repetition, 3 words per sec., which was as fast as the syllables could comfortably be pronounced. The quantitative results are set forth in Table II.

TABLE II

AVERAGE NO. OF REPETITIONS IN FIVE SERIES. NO. WORDS IN SERIES: 50. RATE: THREE PER SEC.

| Series | Obs. | Av. No. Repetitions | Av. Time |
|---|---|---|---|
| I | B | 23.9±5.6 | 8.7±2.5 |
| | W | 32.0±8.6 | 10.7±3.5 |
| II | B | 18.1±3.3 | 6.0±2.6 |
| | W | 19.4±5.2 | 6.3±2.1 |
| III | B | 11.4±1.9 | 3.9±0.9 |
| | W | 15.7±4.3 | 4.6±1.2 |
| IV | B | 10.3±1.9 | 3.4±0.9 |
| | W | 8.7±1.8 | 2.8±0.5 |
| V | B | 11.7±2.2 | 3.8±1.0 |
| | W | 9.8±2.1 | 3.2±0.7 |

It will be noted that the immediate result of our change in instruction, as seen in Series I when compared with the preliminary series, is a decided decrease in the average number of repetitions. This decrease continues through the following series. There is also in the four series a decrease in the magnitude of the relative *m.v.* (from 23% to 18% for *B*, and from 27% to 20% for *W*). The fifth series, which (as has been said) was a test series taken after an interval of two weeks, seems to prove that in Series IV the 'practice effect' had

reached its maximum. The reports show that this 'practice effect' is principally the result of a gradual stabilization of the attitude demanded by the instruction. This result was brought about in two ways. In the first place, an habitual and typical meaning became more frequent as the series progressed. It was characterized by both *O*'s as a 'familiar feel.' There were, however, three variants of this meaning: *O* might be aware (*a*) that he 'knows the meaning of the word,' (*b*) that he 'can call up the meaning,' or (*c*) that 'the word means a certain thing and nothing else.' The last awareness apparently rests upon a conscious attitude; and since it seemed more definite than the other two, it was characterized as a 'definite familiar feel.'[2] Any one of the three seemed to satisfy the instruction, although *a* and *b* occurred more frequently for both *O*'s than *c*. Other meanings, such as imaged visual objects and verbal associations, occasionally appeared; but the tendency throughout the four series was for these to become progressively fewer, and for the 'familiar feels' to become more numerous. In the second place, there is in successive series a progressive inhibition of other, alternative and recurrent meanings in the course of a repetition. In the earlier series such a 'fluctuation' of meanings came frequently, despite all efforts on the part of *O* to take a naïve attitude. The usual case was that of sound association: *way* changed to *whey, skill* to *skillet, lie* to *ye, world* to *whirl,* etc. Occasionally also another meaning of the same word would suddenly appear: *e. g., port* was first *harbor,* but changed to *wine.* In the later series the 'fluctuations' became decidedly fewer in number. The frequency of the various kinds of meaning and of the 'fluctuations' in all five series is given in Table III.

TABLE III

TYPES OF MEANING AND FLUCTUATIONS IN SUCCESSIVE SERIES

| Series | Obs. | Familiar Feels | Def. Fam. Feels | Visual Objects | Other Words | Fluctuations | Not Classified |
|---|---|---|---|---|---|---|---|
| I | B | 25 | 2 | 1 | 15 | 7 | 0 |
| | W | 16 | 0 | 9 | 7 | 14 | 4 |
| II | B | 29 | 9 | 0 | 8 | 0 | 4 |
| | W | 20 | 7 | 2 | 7 | 7 | 7 |
| III | B | 35 | 6 | 0 | 7 | 1 | 1 |
| | W | 17 | 10 | 2 | 5 | 15 | 1 |
| IV | B | 38 | 8 | 1 | 3 | 0 | 0 |
| | W | 30 | 9 | 2 | 6 | 2 | 1 |
| V | B | 35 | 14 | 0 | 0 | 1 | 0 |
| | W | 36 | 7 | 0 | 2 | 5 | 0 |

[2]. Meanings of similar type have been reported by other investigators. See H. P. Weld, Meaning and Process as distinguished by the Reaction Method, *Titchener Commemorative Volume,* 1917, 197 ff., and references there cited.

The experience of the word, when the meaning has dropped away, is generally reported as like that of a nonsense-syllable,—a combination of sounds, neither familiar nor unfamiliar, which has no meaning other than that of mere verbal sound. Occasionally also a 'feeling of blankness' is reported. In some instances, as a result of elision of the accentuation of a vowel or consonant in rapid pronunciation, words become strange, as if they had never before been experienced.[3] There is apparently no shift from a common-sense to a psychological attitude; the sound merely loses its individual, particular, familiar meaning and becomes either a bare word among words or something strange and unknown.

The course of the experience, according to the reports, is of two kinds. The meaning may seem to die out gradually, or it may lapse suddenly after a certain number of repetitions. What exactly happens in the former case, neither *O* was able to say. The effect is probably due to the progressive insistence of the sheer sound of the word; the meaning is thus forced, as it were, into the background, and its loss in distinctness is taken to be a loss in meaning itself. On this point, however, further observations are needed.

*Conclusions.* (1) Given a stably passive attitude on the part of the observer, the meaning of a familiar monosyllabic noun repeated aloud three times per sec. drops away in about 3 to 3.5 sec. (2) There is a tendency, as practice advances, for varieties and fluctuations of meaning to give place to an habitual meaning characterized by our observers as a 'familiar feel.' (3) Meaning may lapse suddenly or die out gradually: the course of experience in the latter case is obscure.

## XLV. The Adjustment of the Hering Color-Blindness Apparatus

By M. Cowdrick and M. Winfield

Some years ago the senior editor of these studies published a note of inquiry[1] concerning an *Anweisung* or set of directions for the adjustment of the Hering Color-Blindness Apparatus, whch had been mentioned by Hering in his description of the apparatus[2] but which had never been obtained by the Cornell Laboratory. Efforts to procure it from Hering himself, from Rothe and from Spindler and Hoyer, the earlier and later manufacturers of the instrument, and from other promising sources had failed; and a request was made for the loan of it, if it were possessed by any reader of the *Journal.* Thus far no reply to the request has been received; and we have therefore undertaken to determine for ourselves what adjustments of the apparatus facilitate the performance of a test for color-blindness,

[3] For other instances of the meaning of strangeness, see Messer, *loc. cit.*

[1] E. B. Titchener, Laboratory Notes, this *Journal,* xxv, 1914, 298.

[2] E. Hering, Zur Diagnostik der Farbenblindheit, *Arch. f. Ophthalm.,* xxxvi, 1, 1890, 217.

and also to obtain norms which may serve as guide to the ready diagnosis of type. We publish an account of our experiments in the hope that it may be useful to other laboratories which possess the apparatus.

We begin with a brief description of the instrument.[3] At the bottom of a short vertical tube is a circular field which, in the test for color-blindness, consists of two semi-circular fields, due the one to a red, the other to a green stimulus. The former is furnished by a window filled with a red glass set in the floor of a light-chamber and illuminated by white light from the surface of a reflector. The reflector moves on a horizontal axis through 120°, and its position (and therefore the amount of reflected light) is marked by a pointer which travels over a graduated arc. When the pointer is at 0° the red is at zero, when it is at 120° the red is at maximal intensity. The hue of the red, which is slightly orange, may be changed by the admixture of blue. This blue light comes from another window filled with blue glass set in the left side of the light chamber and illuminated by a reflector which moves on a vertical axis through 120°. The light, after passing through the blue window, is reflected into the eye of the observer from a surface of clear glass set at an angle of 45°. Since the red rays pass through the same clear glass, they may be mixed with the blue in variable amounts, so that it is possible to obtain all hues from yellowish red to violet. The green stimulus comes from a window of green glass set in the right of the light chamber and illuminated by a reflector in every way similar to that of the blue; its light is reflected into the eye from a total-reflecting mirror set at an angle of 45°. The task of the observer who is to be tested for color-blindness is to match the two semicircular fields in tint and in hue. The match for tint is made by changing the intensity of the green, and that for hue by changing the intensity of the blue stimulus. The intensity of the red stimulus is fixed by the experimenter at the beginning of the test, and is not altered throughout its course. The nature of the stimuli presented to the observer thus depends upon the initial setting of the three reflectors; and that of the red is particularly important. And this was precisely the information which Hering was supposed to furnish in the *Anweisung*, and which we undertook in the first instance to determine.

We began by working in daylight with the instrument facing a well-lighted window. We set all three reflectors at 60° of arc; for we argued that, since all three were graduated to 120°, and since we should be able to obtain more or less as might be necessary of the green and blue components, that was the logical starting point. Under these conditions we found no difficulty in making diagnostic tests; but we found also, as Hayes had already discovered,[4] that the scale-readings were of no value for comparative purposes because they were conditioned upon the intensity of the general illumination. Matches made on a cloudy varied so much from those made on a cloudless day that the scale-readings were in no way comparable.

We decided, therefore, to move the apparatus to the dark room, and to employ artificial illumination. For this purpose we placed directly in front of the instrument an artificial daylight lamp consisting of a

[3] The apparatus is figured by E. B. Titchener, *Experimental Psychology* I., ii., 1901, 7; Text-Book of Psychology, 1910, 84.

[4] S. P. Hayes, Color Sensations of the Partially Color-Blind, *Amer. Jour. Psychol.*, xxii, 1911, 395.

100-watt nitrogen-filled Mazda lamp whose light was filtered through an 8-3/8 in. roundel of Gage's glass.[5] The lamp was so placed that the center of the roundel was approximately opposed to the center of the light-chamber at a distance of about 30 cm. All lateral light was enclosed by the conical reflector to which the roundel is attached. The electric current was taken from the 110-volt A. C. of the university lighting system. In this way the interior of the apparatus was flooded with diffused light; no direct rays impinged upon any one of the windows; and no shadows fell upon the reflectors. We found this arrangement adequate to our purpose.

*Procedure of the Test.* In making a test for partial color-blindness, we place a green glass in the right (to one facing the open side of the apparatus), a red glass in the floor, and a blue glass in the left aperture of the light-chamber. All reflectors are set at 60° of arc, and the iris diaphragm is opened to give a maximal field. *O* is then instructed to look into the tube with his right eye, and to say whether the nearer (green) half is lighter or darker than the farther (red) half of the circular field. If he says 'lighter,' he is instructed to turn the knob on his left hand slowly to the right,[6] if 'darker' to the left, until the two halves of the field appear equal in tint or brightness. When *O* has done his best,[7] he is told to rest his eye for some minutes. Then he is asked to look again, with the same eye, and to say whether the nearer (green) field is *yellower* or *bluer* than the farther (red) field.[8] If he says 'yellower' he is told to turn the knob on his right hand slowly to the left, if 'bluer' to the right, until the two halves are alike in hue. Since this determination has probably altered the brightness-relation of the two fields, the match for tint must again be made as in the first instance; and when this is done, slight corrections for hue may once more be necessary. The two procedures are thus alternated, until the semicircular fields are identical in tint and in hue. When the final match is made, we have found it advisable to have *O* verify it after some minutes of rest. Then the scale-readings are recorded; the reflectors are set back to their original positions, and the test is made for the left eye.

*Results.* We give the scale-readings in degrees of arc for three *O*'s who, as tested by the Nagel Cards, are 'green-blind' (deuteranopes), and for one *O* who by the same test is a 'red-blind' (protanope). Since in all cases the reflector for 'red' remained fixed at 60° of arc, we do not repeat this value in the table.

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[5] For further description of this lamp, see A. J. Brown, Some Uses of Artificial Daylight in the Psychological Laboratory, this *Journal*, xxvii, 1916, 427.

[6] Note that the knob on *O*'s left controls the reflector on *E*'s right.

[7] *E* need not insist on the accuracy of *O*'s match at this stage; the aim is to bring the two fields approximately together in tint, so that the match for hue (which is the next stage) may be facilitated.

[8] Color-blind *O*'s sometimes insist that the two fields are green and red, in which case they must be told emphatically that the instruction was not concerned with green and red, but only with yellow and blue. The cues to their meanings of red and green disappear when the final match is made.

| Obs. | Stimuli | Right eye 1st Trial | Right eye 2nd Trial | Left eye 1st Trial | Left eye 2nd Trial |
|---|---|---|---|---|---|
| *L. C.* | G | 47 | 42 | 46 | 46 |
| | B | 56 | 56 | 60 | 57 |
| *B.* | G | 44 | 43 | 46 | .. |
| | B | 61 | 63 | 61 | .. |
| *O. C.* | G | 45 | .. | 46 | .. |
| | B | 55 | .. | 55 | .. |
| *L.* | G | 37 | 32 | 35 | 32 |
| | B | 42 | 47 | 42 | 41 |

If it is recalled that all reflectors were set originally at 60° of arc, and that a setting at 0° means zero intensity, it will be seen that for all *O*'s the green half of the field was lighter than the red, but that the difference for *L* was much greater than for the other *O*'s. *L* is, however, a protanope; R appears much darker to him than to the deuteranopes; and G must therefore be reduced by a greater amount. It will be seen also that for all *O*'s except *B* the green stimulus is yellower than the red; *B* adds 1 to 3 degrees of blue to the red in making his match, whereas the other observers either subtract blue or make no change. We believe, however, that this result is not significant. All three deuteranopes reported the two fields as fairly well matched in hue before any change was made; and, moreover, *B* was in doubt whether the hue of his final match was yellow or blue. The other observers reported it as slightly yellowish. On the other hand, the fact that *L* requires much less blue than the other observers brings his case into agreement with the results of previous experimenters, who have found that protanopes demand less blue in a mixture of spectral red and blue to match an intermediate color in the yellow region than do deuteranopes.[9]

Our results appear, therefore, to be diagnostic. No doubt, further tests may show greater variation among observers than we have as yet found. But the close agreement of the three deuteranopes whom we have tested, together with the quantitative results which show difference in type, bespeak the usefulness of the Hering apparatus when the illumination is brought under control. Many other combinations of colors than those we have used may be employed; and the apparatus lends itself to attack upon other problems beside those of partial color-blindness. We are, for example, at present applying it to a study of the 'normal Rayleigh equation,' the matching of spectral red and green to yellow; we hope to publish results in the near future.

*Summary.* We have no evidence that the *Anweisung* to the use of the Hering Color-Blindness Apparatus was ever distributed. If it was not, the reason may lie in the fact that the instrument is valueless for comparative purposes if set up in diffuse daylight, and that Hering was reluctant to commit himself to any specific source of artificial illumination available at the time when the apparatus was constructed.

[9] See J. H. Parsons, *Colour Vision*, 1915, 163 f., and the references there cited.

Under our conditions of observation, red-green-blind persons of the ordinary type (deuteranopes or 'green-blinds') find an equation 60° R + 60° B = 60° G fairly satisfactory in hue. A better testing equation, for hue and tint together, is 60° R + 58° B = 45° G.

Red-green-blind persons of the less common type (protanopes or 'red-blinds') may be tested by the equation 60° R + 43° B = 34° G.

These figures are given with the reserve made necessary by the fewness of our observers. Color-blind subjects must be waited for, and their time is not always at the psychologist's disposal. We hope to repeat the observations in further instances.

## XLVI. Adaptation of Superficial Pain

By H. H. Straus and R. F. Uhlmann

As a rule, the authors who discuss pain say nothing about adaptation. Their silence probably means that, under ordinary circumstances of stimulation, adaptation is not observed: perhaps because the phenomenon is not insistent enough to force itself generally upon attention, perhaps because the facts themselves point to continuity of pain with continued stimulation. Continuity is, indeed, suggested by the result of continuous intensive stimulation and by instances of pathological pain, as of course also by the effect of intermittent stimulation even if weak; but adaptation may very well occur with weak continuous stimulation. Cases of the disappearance of pain so aroused have, in fact, been reported. Murray "makes the accidental discovery that superficial pain adapts out almost as readily as superficial contact." She remarks further that "mapping of the same area for pain [as had previously been mapped by a needle-stimulus] with an overheated brass rod, lightly applied, gave practically identical results as regards the position of the points and the occurrence of fatigue."[1] There are also passages in von Frey's writings which indicate a like observation. "Der Cornea (und Conjunctiva) eigenthümlich ist ferner die Erscheinung, dass ein nicht weit über der Schwelle liegender Reiz (1 — 5 gr/mm² für die Cornea) an vielen Puncten im ersten Moment der Berührung nicht gefühlt wird, dass aber bei andauernder Berührung Schmerzempfindung auftritt, *die entweder nach einigen Secunden wieder verschwindet*, oder was häufiger der Fall, soweit anschwillt, dass die Reizung unterbrochen werden muss."[2] Again, in speaking of the conditions of pain in general, von Frey remarks: "Bei andauernder Deformation ist die Schmerzempfindung, *schwächste Reize ausgenommen*, andauernd."[3] It seems, therefore, that under

[1] E. Murray, A Qualitative Analysis of Tickling, *Amer. Jour. Psychol.*, 1908, xix, 304; 305.

[2] M. v. Frey, Beiträge z. Physiol. des Schmerzsinns, *Ber. ü. d. Verhandl. d. Königl. Sächs. Ges d. Wiss z. Leipzig*, 1894, xlvi, 1, 193 (italics ours).

[3] *Untersuch ü. d. Sinnesfunctionen der menschlichen Haut*, 1896, 261 (italics ours).

experimental conditions the pain set up by continuous weak stimulation may disappear. But the observations thus far reported are casual, and no attempt has apparently been made to study the phenomenon of pain-adaptation systematically.

In this paper we report experiments which should be regarded only as preliminary to such a study. We were interested, first, to make out the exact conditions under which adaptation of pain may be experienced, and secondly to determine the times of adaptation with various intensities of stimuli.

*Procedure.* As the cutaneous area to be worked upon we chose the volar side of the fore-arm, about half-way between wrist and elbow. We attempted experiments upon the cornea, but without success; the stimulus started a flow of tears, and observation was impossible. At the beginning of work on the arm we shaved the area, and before every experiment softened the skin with soap and water. We found it advisable also, at the beginning of every period of observation, to localise anew three or four pain spots. These, we made sure, were not too near to pressure spots, and gave pure pain without pressure. Our first stimuli were human hairs, horsehairs and hog-bristles; but although we were able, after long periods, to secure pain-adaptation, we eventually, for reasons given later, abandoned these forms of stimulus. Thereafter we used a needle fastened to the shaft of a Head algesimeter;[4] the needle and shaft together were brought down upon the skin by means of the mechanical appliance described by Dimmick.[5] The arm rested in a plaster cast. We employed three intensities of stimulation; these, as measured on a pressure-balance, and including the friction of the instrument, were 3, 5.5, and 8 gr. respectively. The rate of application was constant; it was also gradual, as we wished to avoid piercing the skin by the needle.

The writers, S and U, served alternately as *E* and *O*, changing places after every few observations. Both had completed a qualitative laboratory-course, in which they had become especially interested in cutaneous qualities. At the beginning of these experiments they spent some time on practice-work, so that they were able to distinguish readily the qualities of contact (weak pressure) and weak pain.

*Results.* With the stimuli above described we have succeeded in obtaining adaptation of pain with a high degree of regularity. It is essential to success that there be no movement either of the stimulus-point or of the skin beneath the stimulus, and also that the intensity of the stimulus remain constant during the period of stimulation. It was mainly for these reasons that we discarded the hairs and bristles for the needle, and a manual for a mechanically controlled means of application. We often, it is true, obtained the phenomenon with hairs and bristles, but we failed no less frequently; and we found further that, after adaptation, it was almost impossible to remove the stimulus by hand without rearousing pain. We failed also when the stimulus was set down over or to the side of a vein, so that we were careful later to avoid veins when localizing pain spots. Finally, we failed whenever there was the slightest movement of the arm, so that the plaster cast became necessary.

In the quantitative experiments, in which we measured the length of the course or adaptation, we found it necessary to inhibit also

[4] H. Head, *Brain*, xxxiv, 1911, 197 (fig. 6.).
[5] F. L. Dimmick, *Amer. Jour. Psychol.* xxvii, 1916, 566.

bodily movement of any sort between stimulations. The reason was purely technical; the least displacement of the pain-spot required a realignment of the mechanical stimulator. To relieve the observer of discomfort we therefore reduced the interval between successive stimulations to 30 sec. The serial nature of our results (there is no decrease in the magnitude of the adaptation-times in successive trials) shows that in this period the pain-spot had sufficiently recovered.

The following table gives the adaptation-times in seconds for each observer and for all three of the intensities of stimulus.

| Intensity of Stimulus | Obs. | No. Cases | Av. Adaptation Time in Sec. | Range of Adapt. Times |
|---|---|---|---|---|
| 3.0 gr. | U | 10 | 5.0±0.6 | 4—7 |
| | S | 10 | 11.9±5.43 | 7—26 |
| 5.5 gr. | U | 20 | 14.0±3.5 | 8—31 |
| | S | 10 | 26.3±7.5 | 15—38 |
| 8.0 gr. | U | 20 | 19.0±5.85 | 13—24 |
| | S | 10 | 44.1±6.96 | 27—72 |

The table shows a large individual difference, but the times for both observers increase progressively with increase in intensity of stimulation. The *m. v.*, particularly of S, are irregular; and the ranges indicate that the temporal course of pain-adaptation is exceedingly variable. The extremely long times never occurred more than once; we are unable to offer any explanation for them, except that, for all our precaution, some slight movement of the observer's arm may have taken place.

# MINOR STUDY FROM THE PSYCHOLOGICAL LABORATORY OF STANFORD UNIVERSITY

## A New Tapping Instrument for Laboratory Use

By Gertrude M. Trace

The development of this new tapping instrument came about through dissatisfaction with the tapping-board and the telegraph key as apparatus for class work. Having found the tapping experiment valuable as a basis for class discussion of practice and fatigue, a search was begun for a reaction instrument which would be inexpensive, eliminate noise, simplify calibration, be consistent in its behavior, be easily handled by large classes with a minimum of variation in procedure, and at the same time present ample introspective material for analysis.

Pneumatic apparatus was first considered, and was discarded chiefly because it took an apparently interminable time to bring about either objective or subjective indications of fatigue. This added another requisite for the instrument: it must bring about fatigue quickly and yet not leave the reagent with sore muscles, or prolong too much the period of rest between records. After about a year's experimentation (1915-1916), an instrument was evolved which has been used by several classes with fair results.

The instrument is light and small, the weight being 50 grams and the length 10.5 cm. The two steel prongs, curved and lined with rubber at the ends to fit the thumb and finger, are 1.5 cm. wide and 7.2 cm. long. The distance between prongs is 2 cm. and it requires a pressure of 1250 grams to bring one into contact with the other, the thumb and finger being then 4 mm. apart. The instrument can be raised or lowered to meet the needs of the reagents; it can be used in either the horizontal or the vertical position.

An electric time-maker in circuit with the instrument records the taps upon the smoked paper on a Zimmerman kymograph, the drum of which revolves once in sixty seconds. The time is checked by a spring time-marker beating quarter-seconds.

The method used is similar to that used by Wells,[1] the results for the 30-second series being tabulated in 5-second intervals, together with the sum, average and fatigue index. A group of non-selected students give the following averages for 33 series: For the 5-second interval the average was 20.9 taps and the median 20.86; for the series the average fatigue index is .83, and the average loss 7.0 taps.

The uniformity of behavior (indicated by the closeness of the average and the median), the quietness, the easy adjustment, make the

[1] F. L. Wells, Normal Performance in the Tapping Test Before and During Practice, with Special Reference to Fatigue Phenomena. *American Journal of Psychology*, XIX, 1908, pp. 437-483.

instrument useful for large classes, and especially so as it brings about acute fatigue rapidly, the effects of which, however, vanish with the release of the prongs. It has the additional advantage in that the tapping rate is so much slower than with the tapping-board and the telegraph key that the reagent is able to note the changes in the rate and character of the tapping and the accompanying fatigue. This introspective phase is a valuable addition to the tapping experiment.

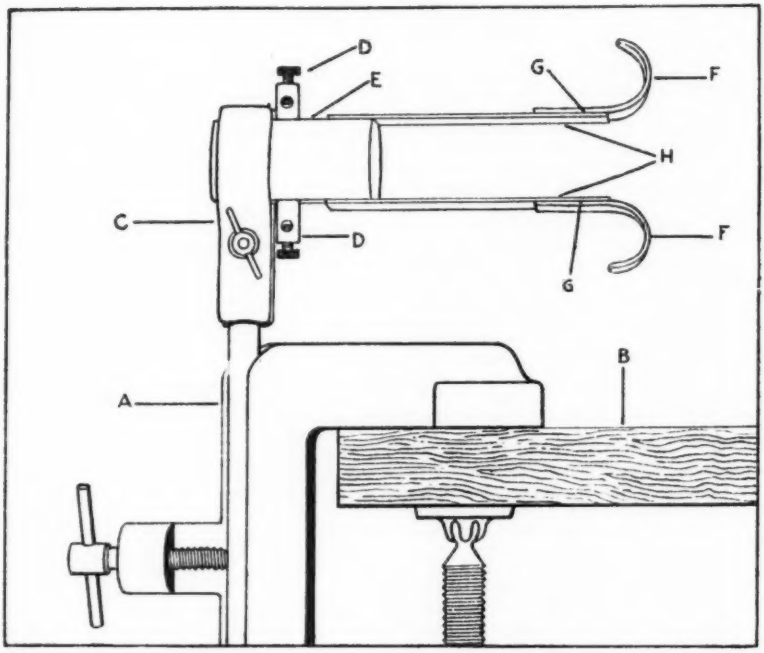


FIGURE 1. Photograph of the tapping instrument. a, table clamp; b, table; c, parallel clamp; d, binding posts; e, hard rubber base; f, steel prongs; g, soft rubber lining; h, steel contacts connected with binding posts and insulated from prongs.

# A FOOTNOTE: "AUTHORSHIP OF THE BOOK OF MORMON"

By Walter Franklin Prince, Ph.D.

My attention has been called to an article by Mr. Theodore Schroeder in the January issue of this magazine, by way of "reply" to my paper in the July, 1917, issue, entitled "Psychological Tests for the Authorship of the Book of Mormon."

Had my argument solely consisted of the *disjuncta membra* which he has torn bleeding from the body of it, it would indeed have deserved contempt. To anyone who has read the emasculated and perverted version all I need to say is, go back and read, for the second or first time, the argument which I really did make. And let him note that the theme is not the authorship of the Book of Mormon (which must by a variety of proofs be awarded, at least in the main, to Joseph Smith) but the contribution which certain psychological tests make to the settlement of the question. Readers who carefully ponder the array of correspondences which I put upon exhibit will not have difficulty in perceiving their collective weight.

But Mr. Schroeder speaks with such confidence about my mental peculiarities (as though these had any bearings upon the data presented), and with such authority about Mormon literature, that I must add a few words of warning.

Unfortunately in his "psychoanalysis" of my humble self he has discovered, as Josh Billings would say, "much that ain't so." He assumes:

(1) That I am a Freudian, which is not true, save in a very modified sense.

(2) That I was governed by "complexes" in the composition of my article. This seems a gratuitous assumption as the strength of the article is in its facts, which remain the same whatever my "complexes." Perhaps the analyzer remembered that he had to explain, in connection with one title in a list of his published papers, "This letter was written under pro-Mormon sympathies which made the author believe he was answering the 'church and state' accusation." He should not so rashly ascribe to others his own emotional tendencies.

(3) That my particular "obsession" is an "anti-secret-society complex." And I a Free-Mason myself, without any prejudices or emotional shocks related to Masonry!

(4) That I arbitrarily chose to fix the authorship of the Book of Mormon upon Joseph Smith. Why on earth would I do that? On the contrary it was the psychological reflections in the book, together with the reflections of the period and region in which he lived, which focussed upon him.

(5) That I am ignorant of the historical facts, whereas I have been familiar with the *pro* and *con* of these for many years. I did not give the whole history of the Kirtland Bank because it would have been irrelevant. The particular device which suggested itself to Smith's mind in his bank difficulty was the only pertinent feature of it.

(6) That I neglected "Doctrine and Covenants" in the application of the tests. Yet my paper plainly sets forth similar reactions in both this and other acknowledged utterances of Smith.

(7) That I was unaware that Smith was afterwards a Mason, or that this matters. He may have been a Mason before the Book of Mormon was written for all that I know. Thousands of Masons left their lodges in disgust in 1826-27, and many afterwards reentered them.

I take space for only two or three of Mr. Schroeder's queer misunderstandings of my statements, and lapses through insufficient acquaintance with the Mormon literary material which he has written so much about.

He declares that I "assume" that the secret society contents of the Book of Mormon was a subconscious product. On the contrary I assumed that the whole book was a conscious one, but conceded the mere possibility that it was written in a secondary or dreamy state.

Why he should be impressed with the necessity of psychoanalyzing me in order to disclose an "anti-secret-society complex," when he himself recognizes that there *are* anti-secret-society passages in the Book of Mormon, is a mystery.

He reproaches me for not going to "Doctrine and Covenants," an acknowledged work of Smith (by "revelation"), and at the same time supposes that the inventions "Olihah" and "tahhanes" are in the Book of Mormon. If he had known the literature of his youth better he would have been aware that it is in "Doctrine and Covenants" that these odd terms are found, or he might by reading my article less carelessly have been informed. If my friend will call on me, I will show him my copy of "Doctrine and Covenants," filled with annotations calling attention to quaint locutions which also characterize the Book of Mormon, but are not found in the extant work of Solomon Spaulding.

Since Mr. Schroeder pins his faith to the naïve theory of Spaulding's authorship, he should have explained how the Book of Mormon happens to contain visions which Lucy Smith unintentionally revealed, in a little book which Brigham Young vainly endeavored to suppress because of its damnatory significance, were the dreams of her husband, whose son, Joseph Smith the prophet, was familiar with them from his childhood.

# BOOK NOTES

*General Psychology.* By WALTER S. HUNTER. Chicago, The University of Chicago Press, 1919. 351 p.

The author thinks that students need more than general formulas and principles, are more interested in accounts of experimental facts and procedures, and are willing to leave the other for the manuals of advanced students. This is the situation this book tries to meet, so that it remains a textbook rather than a treatise. Too much stress upon normal adult psychology or pure psychology is deprecated. Thus, after an introduction on the subject-matter of psychology, the nature of behavior, of consciousness, and on the methods and fields of psychology, we have the different fields presented, viz., animal, individual and applied, abnormal, and social and racial. Then follows Part II on Normal Human Adult Psychology, which includes chapters on attention, the nervous system, reflex action and instinct, the emotions, the affective and sensory processes, imagination and the sequence of experiences, memory, and thinking. The author is entirely right in his conception that a beginner needs a bird's-eye view of the different lines of psychology, so that to our mind he gives us the best general introduction we now have. For ourselves we should have preferred to see the sections on animal and abnormal psychology greatly amplified. We regret, too, that with his synthetic conceptions he has given so little attention to the new and great departures in this field, viz., the Pawlow school and its studies of the conditioned reflex, and psychoanalysis. To entirely omit the latter is a little too much like the play of Hamlet with Hamlet omitted.

*Psychology of the Normal and Subnormal.* By HENRY H. GODDARD. N. Y., Dodd, Mead and Co., 1919. 349 p.

All friends of psychology will be glad that Dr. Goddard has at last attempted a comprehensive psychology as it is developed from his own experience with and study of the Binet-Simon tests. The book is divided into two parts as follows: Part I contains chapters on the nervous system, the beginnings of mind, arrested mental development, some properties inherent in the nervous mechanism, higher mental processes, the affective side of experience, complex emotions, thought, action, habit, and temperament. Part II includes a discussion of applications, the determination of mental levels, intelligence and will, intelligence and emotion, experience, pedagogical applications, and moral training. There is an appendix on The Mechanism of the Emotions by Professor Mosso.

*The Intelligence of School Children.* By LEWIS M. TERMAN. Boston, Houghton Mifflin Co., 1919. 317 p.

Since the author's *The Measurement of Intelligence* the application of tests to the army has developed these procedures, we are told, more than might have been expected in ten years, and it is believed that ere long they will be applied generally to all school children, normal as well as abnormal. The present work is intended mainly for the grade teacher and as an introduction to the author's former book, and its appeal is to state reading circles as well as to parents. The author has drawn largely upon his own tests on students at Stanford University and those made by others more or less under his direction. The book contains twenty-five figures. After discussing the general principles of intelligence testing, the author passes to the amount and significance of individual differences and categories of children, and then proceeds to discuss these differences in children of the first and fifth grades and in the first year of the high school. He gives us mental-age standards for grading, tests of laggards, the IQ as a basis for prediction, and facts about fifty-nine superior children and of another group of forty-one of them. Tests in vocational and educational guidance are then taken up, with practical suggestions for their use.

*Occupational Therapy Applied to Restoration of Movement.* By BIRD T. BALDWIN, Walter Reed General Hospital. 1919. 67 p.

This is an interesting and valuable monograph. The author, after an introduction, explains occupational therapy, procedure in assigning cases of curative work, measurement of range and strength of voluntary movement in stiff joints (including individual illustrations and summaries of type cases). He then gives us examples of type movements occurring in the various occupational activities, with a study of movements involved in planing and engraving. A chapter on peripheral nerve palsies, a list of tools of special curative value, and an outline of the psychological service in the hospital complete the pamphlet.

*Further Investigations in Rational Sex Ethics.* By W. F. ROBIE, M. D. Boston, Richard G. Badger, 1919. 330 p.

This book supplements the author's earlier *Rational Sex Ethics.* Here he treats of psycho-analysis and society, with interesting cases, and has a chapter each on sex and sex histories, birth control, mistakes of a physician, incidental observations, and in the appendix he states and answers criticisms, tells of the fate of his "Sex Ethics for Men in the Army and Navy," gives advice for the newly-wed, discusses whether continence is necessary to the highest achievement, and the old idealism and sex theories.

*A History of the New Thought Movement.* Ed. by HORATIO W. DRESSER, N. Y., Thomas Y. Crowell Co., 1919. 352 p.

This voluminous writer here treats on the new age, Quimby the pioneer, the beginnings of Christian Science, the mental science period, the new thought, its first organizations and conventions, alliance with other organizations, the movement in foreign lands, and kindred movements.

*Contact with the Other World.* By JAMES H. HYSLOP, New York, The Century Co., 1919. 493 p.

This volume, we are told, aims to present "every aspect of the problem regarding a future life." It is the most comprehensive of the author's voluminous works, and is divided into four parts: (1) Historical, beginning with antiquity and coming down to modern spiritualism and psychic research; (2) Preliminary Problems, discussing future life, evidence, human personality, telepathy, and the process of communication; (3) Evidence of Survival, including experiences of well-known persons, spontaneous and experimental incidents, R. S. Gifford, Professor James, Mark Twain, I. K. Funk, Carroll D. Wright, with explanations and objections; and (4) Miscellaneous Questions, including the physical phenomena of spiritualism, mode of life after death, revelations of the other world, reincarnation, obsession, mediumship, the subconscious, religion and science, psychology and medicine, psychic research in war, psychics and politics, and finally a summary. There are also illustrations of experiments in telepathy and the Thompson-Gifford Case.

*Experiments in Psychical Science.* By W. J. CRAWFORD. N. Y., E. P. Dutton and Co., 1919. 201 p.

This is a study of the physical phenomena of spiritualism and goes further into detail than the author's previous *The Reality of Psychic Phenomena* published two years earlier. The chapters are entitled: New Problems and Experiments on Reaction, Miscellaneous, Analysis of Results, Questions and Answers, Contact Phenomena, and Direct Voice Phenomena.

*Laboratory Outline of Neurology.* By C. JUDSON HERRICK and E. C. CROSBY. Philadelphia, W. B. Saunders Co., 1918. 120 p.

This work is the substance of a course developed in the last twenty years at the University of Chicago in which many teachers have participated and to which all have contributed something of value. The purpose of the procedure here outlined is to assist the student as early in his course as possible to formulate his knowledge of the nervous system in terms of the functional significance of its parts. To this end free use is made of the methods of functional analysis of the nervous system which have been developed chiefly in American laboratories. The book has an excellent bibliography and is not overburdened with cuts. It is almost entirely devoted to the Mammalian nervous system, with descriptions of the structure of the different parts, and with adequate laboratory directions for practical work.

*The Erotic Motive in Literature.* By ALBERT MORDELL. New York, Boni and Liveright, 1919. 250 p.

The author of this book has hit upon a very happy idea, viz., that of taking a number of poets—Keats, Shelley, Wordsworth, Poe—and comparing the actual events of their lives with their love poems to show how much the latter were influenced by the former. But besides this there is a background of exposition and general discussion of the main Freduian principles as applied to English literature, in which

he is evidently very widely read. The author seems to have an excellent general acquaintance with Freudian principles but he expressly ignores Jung and Adler.

The book is particularly significant and timely because it gives to those who read English the first good illustration of the application of psycho-analysis to English poetry. The candid reader cannot fail to recognize that the author makes a chief point of the close relation between love experiences and poetry, even in the most frigid writers like Wordsworth. Probably if he had taken the larger field of fiction he might have shown this even better. The chief significance of the book, however, is the advent of a new school of criticism which goes back of the conscious purposes of an author and shows conclusively that while he thinks he is saying or writing one thing, he is, to the psychologist of the unconscious, saying or writing something very different.

*The Challenge of the War.* By HENRY FRANK. (Introduction by Hereward Carrington.) Boston, The Stratford Co., 1919. 372 p.

This book, which is dedicated to Le Bon, grew out of a series of lectures delivered twenty years ago on Immortality. They were reproduced in a small pamphlet and amplified in another publication in 1909, while this is largely a more thorough-going edition, designing to show the marvels of psychological and psychic phenomena. In 1911 Haeckel wrote the author a letter criticizing his views as those primarily of a theologian and metaphysician, and therefore dualist, and suggested that he make an exhaustive study of biology. In this present work the author has analyzed and undertaken to refute the views of Haeckel and others. The thirty-nine chapters of the volume are admirably analyzed and are divided into three books, viz.: The Scientific Negations of Immortality, The Scientific Limitations of Reason, and Intimations of Scientific Proof of Immortality. In the later chapters he discusses thought photography and spirit identity, Oliver Lodge's "Raymond," and proposes an election theory of thought and of the after life. He discusses the immortality of matter, the gateway of another sphere, etc.

*American Leaders.* By WALTER LEFFERTS. Phil., Lippincott, 1919. 329 p.

A score of Americans are grouped here in three rubrics, viz., those who helped to make our country independent, those who helped to make it strong, and those who helped to make it larger. The stories are well-told but there are perhaps a couple of dozen illustrations of a rather modest not to say cheap order. The idea, however, is an excellent one, although it is a far less ambitious attempt to give biography the importance it demands in the school than various other efforts. The names are well-chosen. We ought to have more and better books of this sort.

*Mind and Conduct.* By HENRY R. MARSHALL. N. Y., Scribner, 1919. 236 p.

Here the author has gathered together in a single volume the discussion of certain problems relating to human conduct to which his attention has been turned in the course of his psychological studies,

and which were embodied in the Morse Lectures which he gave at the Union Theological Seminary. The first is on the Correlation of Mind and Conduct and discusses consciousness and behavior, instinct and reason, and the self. Part II is Some Implications of the Correlation, under which heading he discusses creativeness and ideals, freedom and responsibility. Part III, which treats of Guides to Conduct, takes up pleasure and pain, happiness, intuition and reason. There are two appendices, the causal relation between mind and body, and outer-world objects.

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NOTE

*The American Journal of Psychology* is glad to print the following resolution by the American Federation of Labor emphasizing the national importance of scientific research.

"*Whereas,* scientific research and the technical application of results of research form a fundamental basis upon which the development of our industries, manufacturing, agriculture, mining, and others must rest; and

*Whereas,* the productivity of industry is greatly increased by the technical application of the results of scientific research in physics, chemistry, biology and geology, in engineering and agriculture, and in the related sciences; and the health and well-being not only of the workers but of the whole population as well, are dependent upon advances in medicine and sanitation; so that the value of scientific advancement to the welfare of the nation is many times greater than the cost of the necessary research; and

*Whereas,* the increased productivity of industry resulting from scientific research is a most potent factor in the ever-increasing struggle of the workers to raise their standards of living, and the importance of this factor must steadily increase since there is a limit beyond which the average standard of living of the whole population cannot progress by the usual methods of re-adjustment, which limit can only be raised by research and the utilization of the results of research in industry; and

*Whereas,* there are numerous important and pressing problems of administration and regulation now faced by federal, state, and local governments, the wise solution of which depends upon scientific and technical research; and

*Whereas,* the war has brought home to all the nations engaged in it the overwhelming importance of science and technology to national welfare, whether in war or in peace, and not only is private initiative attempting to organize far-reaching research in these fields on a national scale, but in several countries governmental participation and support of such undertakings are already active; therefore be it

*Resolved,* by the American Federation of Labor in convention assembled, that a broad program of scientific and technical research is of major importance to the national welfare and should be fostered in every way by the Federal Government, and that the activities of the Government itself in such research should be adequately and generously supported in order that the work may be greatly strengthened and extended; and the Secretary of the Federation is instructed to transmit copies of this resolution to the President of the United States, to the President pro tempore of the Senate, and to the Speaker of the House of Representatives.

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